VOLUME 19 2004

Muelleria

Royal Botanic Gardens Melbourne

150

1853-2003

NATIONAL HERBARIUM OF VICTORIA

Celebrating 150 years of plant research in Australia

Muelleria publishes research papers on Southern Hemisphere plant, algal and fungal systematics, particularly relating to Australia and the states of Victoria and Tasmania, and to the collections of the National Herbarium of Victoria. Acceptable submissions include: taxonomic revisions; phylogenetic and biogeographical studies; short papers describing new taxa, documenting nationally significant new records, or resolving nomenclatural matters; historical analyses relevant to systematics; any other research contributing to our knowledge of plant, algal or fungal diversity.

Muelleria is published annually or semiannually by the National Herbarium of Victoria, Royal Botanic Gardens Melbourne. Manuscripts should be sent in triplicate to:

The Editor, *Muelleria*
Royal Botanic Gardens, Melbourne
Birdwood Avenue
South Yarra Vic. 3141
Australia
Muelleria@rbg.vic.gov.au
http://www.rbg.vic.gov.au/muell/

Muelleria may be found online at http://www.rbg.vic.gov.au/muell/. A cumulative index to scientific names as well as the *Instructions to Contributors* may also be found at this address. Twenty-five reprints of each accepted paper are provided free of charge. Subscription details can be obtained from the address above.

Editor — Teresa Lebel

Editorial Advisory Committee
Tom May
Jim Ross
Neville Walsh
Frank Udovicic
Daniel Murphy

Volume 19
Autumn 2004

© Royal Botanic Gardens Melbourne 2004
ISSN 0077-1813

MUELLERIA

CONTENTS

Volume 19, 2004 Page

Contributed Papers

Two new wattles endemic to Victoria
– Neville G. Walsh 3

Morphometric Study of a Hybrid Population of *Acacia verniciflua* and *A. aspera* (*Acacia* subgenus *Phyllodineae*)
– Robert C. Piccinin[1], Daniel J. Murphy[1,2] and Pauline Y. Ladiges[1] 9

A revision of the *Thelymitra pauciflora* R.Br. (Orchidaceae) complex in Australia
– Jeffrey A. Jeanes 19

A revision of *Bedfordia* DC. (Asteraceae)
– A.E. (Tony) Orchard 81

Olearia brevipedunculata (Asteraceae): a new species from alpine areas of mainland Australia.
– Neville G. Walsh 95

Taxonomic studies of Australian *Senecio* (Asteraceae): 1. The disciform species
– Ian R. Thompson 101

Muelleria volume 18 was distributed on 28 November 2003

Muelleria 19: 3–8 (2004)

Two new wattles endemic to Victoria

Neville G. Walsh

National Herbarium of Victoria, Royal Botanic Gardens Melbourne, Private Bag 2000, Birdwood Ave, South Yarra, Victoria 3141. Neville.Walsh@rbg.vic.gov.au

Abstract

Acacia sporadica and *A. aspera* subsp. *parviceps* are described as new. Both are Victorian endemics of restricted distribution. *Acacia sporadica* appears to be most closely related to *A. penninervis*, *A. caerulescens* and *A. obliquinervia*. Both new taxa are illustrated and notes on their distribution, ecology and conservation status are provided.

Introduction

In the course of preparing descriptions of *Acacia* for the *Flora of Victoria* (Entwisle *et al.* 1996), *Flora of Australia* (Maslin 2001a) and *Wattle, Acacias of Australia* (Maslin 2001), some taxa of uncertain affinities were identified. Subsequent examination and fieldwork has allowed two of these to be elucidated and they are described here as new.

Taxonomy

Acacia sporadica N.G. Walsh, *sp. nov.*

Acacia penninervis affine habitu minore saepe rhizomatoso, phyllodiis minoribus glaucis, floribus citrinis vere vel hieme factis et seminc transversali differt.

Type: Victoria, Midlands, Carboor Upper, *N.G.Walsh 5583*, *A. Gibb, R. Leeton*, 26.vii.2002 (holotype: MEL; isotypes CANB, NSW, PERTH).

Acacia sp. C. Maslin, *Flora of Australia* : 11A: 253 (2001a); *Acacia* affin. *penninervis*. Maslin, *Wattle, Acacias of Australia* (2001).

Shrub to 3 m high, reproducing mainly by root suckers; branchlets glabrous, yellowish, terete or faintly ridged for the greater part, strongly angular on new season's growth. Phyllodes obovate to elliptic, 25–65 mm long, 8–32 mm wide, usually slightly asymmetric, glabrous, glaucous, obtuse, sometimes with a short (to c. 0.5 mm long) straight or uncinate apiculum; faintly to moderately prominently pinnately veined, the veins anastomosing toward the margin, midrib and marginal veins very prominent, yellowish; gland 5–20 mm above pulvinus, margin often shallowly indented at gland which is not obviously connected to midrib by a lateral vein. Racemes axillary, sometimes appearing paniculate on naked extremities of branchlets; rachis 15–70 mm long, glabrous, angular; peduncles 3–6 mm long, glabrous; heads globular, 5–8 mm diam., 15–25-flowered, bright lemon-yellow. Bracteoles peltate, c. 0.5 mm diam., pale to dark reddish-brown, minutely fimbriate. Flowers 5-merous; sepals united, the free portion c. 1 mm long, puberulent. Pods ±oblong, 40–90 mm long, 10–15 mm wide, rarely constricted between the (0–)3–9 seeds, thinly coriaceous; seeds transverse, oblong to elliptic, 4–5 mm long, slightly shiny, black, funicle pale brown, aril clavate, up to c. half as long as seed. Flowers July–Sept. (Fig. 1c, d)

Representative specimens examined (17 specimens examined): **Victoria:** South side of Howqua River, ca 5 miles [8 km] ESE of bridge on Mansfield – Jamieson Rd, *J.H. Willis s.n.* 16.iv.1976 (MEL); Fryers Range State Forest, 5 km W from Taradale, *N.G. Walsh 5581, E. & L. Perkins*, 26.viii.2002 (MEL); Carboor Upper, 15.5 km due SW from Myrtleford, *N.G. Walsh 5582, A. Gibb, R. Lecton*, 26.viii.2002.

This species has in the past either been included within *A. penninervis* (e.g. Entwisle *et al.* 1996) or treated as a distinct taxon related to *A. penninervis* (e.g. Maslin 2000, 2000a). It differs from *A. penninervis* in the smaller, often root-suckering growth-habit, the shorter, relatively broader, glaucous phyllodes with glands that are not connected to the midrib by a prominent vein, the bright yellow (rather than cream or nearly white) flowers that are produced in late winter to early spring (*A. penninervis* is principally a summer-flowered species), and the smaller seeds that are transverse (rather than longitudinal) in the pods. The nearest occurrence of *A. penninervis* to any of the *A. sporadica* populations is near Avenel, c. 100 km WSW from the Carboor population. *Acacia sporadica* also resembles *A. caerulescens* Maslin & Court and *A. obliquinervia* Tindale. The former is a species of restricted distribution on limestone geology in East Gippsland and the latter widespread in montane areas of New South Wales, Australian Capital Territory and Victoria. Both are tall shrubs or small trees, often with pruinose branchlets, generally larger, more prominently asymmetric phyllodes with the gland clearly connected to the midrib by a vein. Both generally flower later in the year than *A. sporadica*.

Distribution and conservation status: *Acacia sporadica* is endemic in Victoria where it is known from only three small, widely separated populations, the largest of which near Carboor (c. 180 km north-east of Melbourne) extends over an area of c. 1.5 km x 0.5 km and includes perhaps 3000 plants. Some of these are clearly individual plants and some are parts of clones of up to 50 stems arising from an extensive rhizome system. There is a low level of seed production throughout this population. A population near Howqua (c. 140 km north-east of Melbourne) consists of 9 clones over an area of c. 250 m x 50 m, varying from c. 3 to 9 m diameter and each including up to c. 200 stems. All the 'plants' in this population appear to be functionally sterile (no seed production noted between 2000 and 2002). The third population near Taradale (c. 100 km north-west of Melbourne) consists of only 3 depauperate ramets, two of which are mature and only c. 15 cm apart, the third a non-flowering (in 2002) 'plant' c. 25 cm high and c. 5 m from the others. It is not known if these plants are separate individuals or are connected by rhizomes. There has been no confirmed seed set on plants in the Taradale population since their discovery in 1976 (E. Perkins pers. comm. 2002). There have been unsuccessful searches for more plants in similar habitat in the area around Taradale. The conservation status of *A. sporadica* is assessed at 2Vi (Briggs & Leigh 1996) or Vulnerable (VU sensu. IUCN 1994). No populations are represented within biological reserves. Some plants at the Howqua site were destroyed through roadworks during 2002. The Taradale population is clearly endangered.

Habitat: At each of the three sites *A. sporadica* occurs in grassy, dry eucalypt woodland or open forest, with *Eucalyptus goniocalyx* dominant or co-dominant (with *E. macrorhyncha* at both Taradale and Carboor, and *E. dives* at Howqua). At each site soils are shallow, derived from Ordovician (Fryers Ridge) or Silurian (Carboor, Howqua) sedimentary parent material. The tussock grass *Joycea pallida* is abundant at all three sites. Altitudes vary from c. 350 to 750 m a.s.l.

Notes: There are slight differences between plants from each of the 3 known areas of occurrence. Those at the Howqua site are smallest (mostly under 1 m high), with generally smaller, relatively narrower phyllodes and smaller inflorescences (raceme length typically under 40 mm). Plants near Taradale have very coriaceous phyllodes with the gland up to only 15 mm from the base of the phyllode (plants from other populations have the gland up to 22 mm from the phyllode base). Plants from Carboor are the only ones known to produce seed, and even here there is a very high level of abortion of developing seed.

The clonal, root-suckering habit of *A. sporadica* is of interest as another recently described species, *A. daviesii* Bartolome (Bartolome *et al.* 2002) also has a clonal habit, and is apparently confined to a few square kilometres less than 15 km from the Howqua

Figure 1. **a, b** *Acacia aspera* subsp. *parviceps*: **a** Habit ×1, phyllode apex detail × 10, peduncle detail × 20 (*N.G. Walsh 5219*, MEL); **b** Pod × 2, seed and attachment detail × 4 (*N.G. Walsh 5702*, MEL); **c, d** *Acacia sporadica*: **c** Habit × 1, gland detail × 5, phyllode apex × 5 (*N.A.F. Gibb 1211*, MEL); **d** Pod × 1, seed and attachment detail × 2. (*N.A.F. Gibb 1212*, MEL).

population of *A. sporadica*. Bartolome *et al.* (2002) demonstrated that ramets within a population were genetically identical, but there were genetic differences between most populations. It is not known if there is any genetic variation between the clones at Howqua, or the 3 ramets at Fryers Ridge sites, but it is assumed that plants produced from seed at Carboor will possess a degree of genetic variation.

It would appear that the 3 disjunct localities of *A. sporadica* represent remnant occurrences of a formerly more widespread distribution for *A. sporadica* or its ancestral taxon.

Etymology: The epithet refers to the widely scattered distribution.

Acacia aspera Lindl. subsp. ***parviceps*** N.G.Walsh *subsp. nov.*

A subspecie typica capitulis minoribus, floribus paucioribus compositis, bracteis brevioribus glandulosis differt.

Type: Victoria, Midlands, Brisbane Ranges National Park, extreme NE corner, *N.G. Walsh 5218*, 23.viii.2000 (holotype: MEL; isotypes CANB, NSW, PERTH).

Acacia aspera (Brisbane Range variant) Maslin, 'Wattle, Acacias of Australia' (2001); Acacia aff. *aspera* (Brisbane Ranges) J.H. Ross & N.G. Walsh, Census Vasc. Pl. Victoria edn 7, 91, 124 (2003)

Spreading shrub to c. 1.5 m high; branchlets finely ribbed, becoming terete on older growth, hispidulous with a mixture of erect, gland-tipped and finer, usually shorter, eglandular hairs. Phyllodes oblong to narrowly obovate, 6–26 mm long, 2–4(–7) mm wide, usually strongly concavo-convex in section, rarely ±flat, obtuse to rounded at apex, usually with a coarse apiculum to c. 1 mm long, inserted asymmetrically; midrib ±central, lateral nerves oblique, often obscure and not clearly reaching margin; margin thickened, nerve-like, marginal gland apparently lacking; surfaces hispid with coarse, patent gland-tipped hairs to c. 0.5 mm long, mainly above midrib and near margins, intermixed with shorter finer patent hairs of variable density. Inflorescences simple, 1–2(–3) per axil; peduncles (7–)9–16 mm long, slender, hispid with only gland-tipped hairs, or with gland-tipped and shorter, finer, eglandular hairs in up to ±equal proportions; heads globular, 4–6 mm diam. (on herbarium sheets), (15–) 24–35-flowered, cream to lemon-yellow. Bracteoles subulate, 0.5–0.8 mm long, shorter than buds immediately before anthesis, reddish-brown, hispidulous, gland-tipped. Flowers 5-merous; sepals united for most of their length, c. 0.8 mm long, hispidulous near base, resinous near apex. Pods ±oblong or slightly curved, 15–35 mm long, 4–6 mm wide, biconvex, not or barely constricted between the 2–6 seeds, firmly chartaceous to thinly coriaceous, covered with spreading, multicellular, gland-tipped hairs to c. 1 mm long, often with a few shorter unicellular eglandular hairs; seeds longitudinal, oblong-elliptic, c. 4 mm long, 2.5 mm wide, shining dark brown, funicle/aril terminal, sigmoid, basally thickened, yellowish, c. 1 mm long. Flowers July–Oct. (Fig. 1a, b)

Distinguished from subsp. *aspera* in the relatively long, slender peduncles with indumentum of gland-tipped hairs sometimes mixed with shorter eglandular hairs (subsp. *aspera* has stout peduncles to 10 mm long with sessile or subsessile glands and sometimes eglandular hairs, which when present, distinctly exceed the glands); the short, gland-tipped bracteoles subtending individual flowers in the heads (subsp. *aspera* has eglandular bracteoles clearly exceeding the buds immediately before anthesis giving the buds a characteristic burr-like appearance); generally pale lemon-coloured, few-flowered, smaller heads (subsp. *aspera* has bright golden yellow, 30–50-flowered heads, 6–9 mm diam. on herbarium sheets). The phyllodes of subsp. *parviceps* are pronouncedly concavo-convex in section whereas those of subsp. *aspera* are typically flat to slightly concavo-convex in section, and they are generally smaller than those of subsp. *aspera*, but there is some overlap in these characteristics.

Representative specimens examined (22 specimens examined): **Victoria:** Brisbane Ranges, between Bacchus Marsh and the Brisbane Ranges, *B.R. Maslin 3498*, 4.xi.1973 (MEL, PERTH); Brisbane Ranges, Mt Wallace-Bacchus Marsh Rd, *A.C. Beauglehole 56736*, 2.x.1977 (MEL); 4.5 km S of Beaufort, *A.C. Beauglehole 61680*, 19.xi.1978 (MEL); McHughes Rd, 5.5 km SW of Wedderburn, *J. Connock 339*, 30.viii.1992 (BRI, MEL); Werribee Gorge National Park, Ironbark Rd, *N.G. Walsh 5360*, 15.viii.2001 (CANB, MEL, NSW).

Distribution and conservation status: *Acacia aspera* subsp. *parviceps* is endemic in Victoria and is known from the northern part of the Brisbane Ranges and nearby Werribee Gorge area (c. 60 km WNW from Melbourne), Beaufort area (c. 140 km WNW from Melbourne), and near Wedderburn (c. 190 km NW from Melbourne). In the Brisbane Ranges and Beaufort areas plants are common to locally dominant in the lower shrub stratum. The Wedderburn population represented by *Connock 339* could not be relocated and the size is unknown. The taxon is well conserved in the Brisbane Ranges National Park, and nearby Werribee Gorge State Park. Its risk code is assessed as Rare (2Rca *sensu* Briggs & Leigh 1996) or Near Threatened (NT *sensu* IUCN 1994).

Acacia aspera subsp. *aspera* is a locally common and widespread species occurring in auriferous country in mid-western to north-eastern Victoria, extending northwards to the Australian Capital Territory and central New South Wales. It is not sympatric with subsp. *parviceps* at any known locality, but occurs as close as c. 40 km in a few localities (e.g. Avoca, Dunolly, St Arnaud, Stawell districts).

Habitat: *Acacia aspera* ssp. *parviceps* occurs on shallow soils derived from Ordovician sediments (shales, siltstones, sandstones), in dry to moist open forest typically dominated by combinations of *Eucalyptus goniocalyx, E. macrorhyncha, E. tricarpa* in the Brisbane Ranges, and *E. goniocalyx, E. melliodora, E. obliqua,* and *E. aromaphloia* south of Beaufort. At most sites in these areas the field layer is dominated by *Joycea pallida* with various low shrubs. There is no habitat information accompanying the Wedderburn specimen, but open forests of *Eucalyptus tricarpa, E. leucoxylon* and *E. microcarpa* are common in the area.

Notes: A few collections here referred to subsp. *parviceps* differ slightly from the form of the taxon in the Brisbane Ranges represented by the type. Plants south of Beaufort (e.g. *Beauglehole 61680*) and near Wedderburn (*Connock 339*) approach subsp. *aspera* in having slightly brighter, lemon-coloured heads on short (to c. 7 mm long) peduncles that are indumented by sessile or subsessile glands and longer eglandular hairs, but have head diameter and floral bracts typical of subsp. *parviceps*. Plants from the Werribee Gorge State Park (c. 10 km north of the nearest known population of subsp. *parviceps*) have relatively large, 30–50-flowered, bright yellow heads, long floral bracts and relatively large phyllodes typical of subsp. *aspera*, but with peduncles to 13 mm long with indumentum more typical of subsp. *parviceps* (i.e. with glandular hairs longer than eglandular hairs).

Etymology: The epithet of the new subspecies is from the Latin *parvus* (small), *-ceps* (headed) and refers to the flower heads that are smaller than those of the typical subspecies.

Acknowledgements

I am grateful to Ern and Leslie Perkins of Castlemaine, Alan Gibb of Bobinwarrah and Russ Leeton of Carboor for sharing their field knowledge of *A. sporadica* with me, to Bruce Maslin (PERTH) for helpful discussions and encouragement, and to Mali Moir for illustrating the new taxa.

References

Bartolome, M., Walsh, N.G., James, E.A. & Ladiges, P.Y. (2002). A new, rare species of *Acacia* from north-eastern Victoria. *Australian Systematic Botany* **15**, 465–475.

Entwisle, T.J., Maslin, B.R., Cowan, R.S. & Court, A.B. (1996). '*Acacia*' in *Flora of Victoria* vol. 2, eds N.G. Walsh & T.J. Entwisle, Inkata Press, Melbourne.

IUCN (1994). *IUCN Red List Categories*, International Union for Conservation of Nature and Natural Resources, Gland, Switzerland.

Maslin, B.R. (2001). *Wattle, Acacias of Australia* CD-ROM, ABRS & CALM (2001)

Maslin B.R. (2001a). '*Acacia*' in *Flora of Australia* vol. 11A, eds A.E. Orchard & A.J.G. Wilson, ABRS, Canberra & CSIRO Publishing, Melbourne.

Ross, J.H. & Walsh. N.G. (2003). *A census of the vascular plants of Victoria*, Royal Botanic Gardens, Melbourne.

Muelleria 19: 9–18 (2004)

Morphometric Study of a Hybrid Population of *Acacia verniciflua* and *A. aspera* (*Acacia* subgenus *Phyllodineae*)

Robert C. Piccinin[1], *Daniel J. Murphy*[1,2] *and Pauline Y. Ladiges*[1]

[1]School of Botany, The University of Melbourne, Parkville, Vic. 3010.
[2]Current address, Royal Botanic Gardens, Melbourne, Birdwood Ave, South Yarra, Vic. 3141
Corresponding author: daniel.murphy@rbg.vic.gov.au

Abstract

Hybrids between the common variant of *Acacia verniciflua* A.Cunn. and *Acacia aspera* Lindl. are reported from central Victoria, in remnant vegetation in the median strip of the Hume Highway, south of Benalla. Plants of both species and suspected hybrids were sampled and mapped along a belt transect. Morphological pattern analysis, based largely on phyllode characters and using ordination and agglomerative classification techniques, confirmed a hybrid population of plants intermediate between *A. verniciflua* and *A. aspera* and possible backcrosses to one or other of the parent species. Scanning electron microscopy revealed that hybrids had density of simple hair and morphology of glandular trichomes intermediate between the two parents. The site has been disturbed, which may account for the hybrid swarm.

Introduction

Acacia verniciflua A.Cunn. (Varnish Wattle) occurs in South Australia, Queensland, New South Wales, Victoria, and Tasmania Fig. 1 (Fig. 1; Maslin 2001). It is a viscid shrub to small tree (1-8 m high) and highly variable across its range, with four variants in Victoria: common, southern, Casterton and Bacchus Marsh (Entwisle *et al.* 1996). Phyllodes are characterised by two main veins and glands (presumably resin-secreting), which are stalkless or sunken.

Acacia aspera Lindl. (Rough Wattle) is a spreading viscid shrub (0.5-2 m high) found in New South Wales and Victoria. It is less variable than *A. verniciflua* (Maslin 2001) with a single, newly recognised subspecies, *Acacia aspera* subsp. *parviceps*, found in

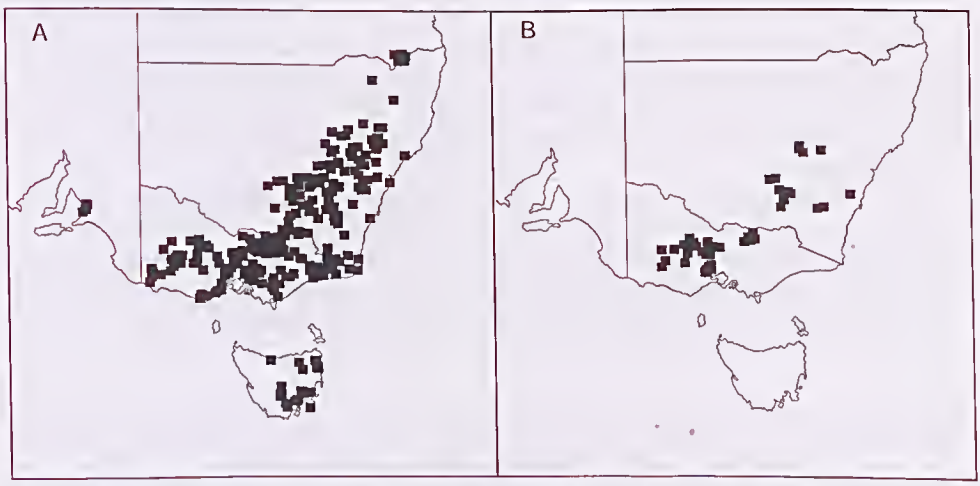

Figure 1. Geographic distribution of *Acacia verniciflua* and *A. aspera* in south-eastern mainland Australia.

Figure 2. Location of the study site, the Hume Highway, south of Benalla, Victoria.

Victoria in the Brisbane Ranges and near Beaufort (Walsh, 2004). Phyllodes have one main vein and flower buds have acuminate exserted bracteoles (Entwisle *et al.* 1996). The species is characterised by numerous simple hairs and glandular trichomes covering vegetative and reproductive structures. The latter are variously described as glandular hairs (Boughton 1989) or coarse hairs, gland-tipped (Entwisle *et al.* 1996).

Both *A. verniciflua* and *A. aspera* are classified in section *Phyllodineae* and are considered related (Maslin 2001). Entwisle *et al.* (1996) placed *A. verniciflua* in Group 3 and *A. aspera* in Group 4 of their treatment, although these groups are informal and do not necessarily reflect natural relationships. The geographic ranges of the two species overlap and in some localities they are sympatric. A mixed-species population of the common variant of *A. verniciflua*, *A. aspera*, and plants intermediate in morphology, has been found in central Victoria, south of Benalla (Fig. 2). The vegetation is remnant eucalypt woodland in the median strip of the Hume Highway and the site appears to have been disturbed (e.g. soil and drainage) by road-making. Given that *A. verniciflua* and *A. aspera* flower at the same time of the year, between July and November (Entwisle *et al* 1996), it was hypothesised that the intermediate plants are of hybrid origin between these two putative parents.

Natural hybridisation in *Acacia* Miller has been reported by a number of authors (Cheel 1935; Moffett 1956; Leach & Whiffin 1978; Ali & Qaiser 1980; Sedgley *et al.* 1992, Entwisle *et al.* 1996). Hybrids between *A. aspera* and *A. montana* have been recorded from the Whipstick, near Bendigo, Victoria (Maslin 2001), but no record of hybridisation between *A. verniciflua* and *A. aspera* has been reported to date.

Method

The study site is located 185km north of Melbourne along the Hume Highway, 3 km north east of Erreys road, on the median strip between the north- and south-bound lanes (Latitude: S 36° 36' 11", Longitude: E 145° 49' 30"). The remnant vegetation is dominated by *Eucalyptus microcarpa* (Maiden) Maiden, *E. melliodora* A.Cunn. ex

Schauer, *E. polyanthemos* Schauer, *E. blakelyi* Maiden and *E. macrorhyncha* F.Muell. ex Benth. *Acacia* species at the site include *A. verniciflua*, *A. aspera*, *A. pycnantha* Benth. and *A. genistifolia* Link, and grasses are predominantly *Austrodanthonia* spp.

A 40 m belt transect line running north-south, parallel with the road, was used to sample the *A. aspera* and *A. verniciflua* population in the median strip. Sampling was done in April 2003, and no flowers or legumes were present. Some plants showed signs of severe drought stress. Every healthy plant within 2m to the east of the transect line was sampled. The height of the plant and the distance along the transect line where it was found were recorded. A sample of branchlets with phyllodes was taken from each plant for morphological measurements. Plants were sampled for voucher herbarium specimens (RP1-35 lodged at MELU). One plant typical of each of *A. aspera* and *A. verniciflua* and four suspected hybrids were also sampled for phyllode preservation in 70% ethanol.

Thirty-five specimens collected from the study site were measured for 12 phyllode, branchlet and bud characters (Table 1). Forty additional specimens from the National Herbarium of Victoria were also measured (Appendix 1, numbered 36 - 75), consisting of twenty specimens each of *Acacia verniciflua* and *A. aspera*, and including 10 samples from the north-east of Victoria. Five phyllodes were measured from each specimen, while bud and branchlet characters were scored by scanning the entire specimen. Averages of the measurements were taken in order to produce an individual score for each specimen.

Table 1. Characters measured for morphological analysis.

1.	Phyllode length (mm)
2.	Phyllode width at widest point (mm)
3.	Phyllode curvature (falcate or not): widest distance of inner edge of phyllode from a vertical line between base and tip of phyllode (mm)
4.	Distance from base of phyllode to the widest point of phyllode (mm)
5.	Distance from base of phyllode to the marginal gland (mm)
6.	Phyllode thickness (mm)
7.	Number of main veins on phyllode
8.	Length of pulvinus (mm)
9.	Resin glands stalked or sessile
10.	Branchlets distinctly tomentose (hairs) or not
11.	Flower buds with braeteoles exserted or not
12.	Peduncle and buds hairy or not

The computer package PATN (Belbin 1995) was used for phenetic pattern analysis of the data. The Manhattan metric distance measure was used to construct a distance matrix and both unweighted pair group method of averaging (UPGMA) and non-metric multidimensional scaling (NMDS) were used for classification and ordination analyses (Clifford and Stephenson 1975).

Samples of the phyllodes preserved in 70% ethanol were prepared for Scanning Electron Microscopy (SEM). Samples were gradually dried out through a series of 70%, 80%, 90% and 100% ethanol. Sections were critical point dried, mounted onto stubs with an adhesive carbon disc, sputter coated with a thin coating of gold and viewed under a X1-30 Philips SEM.

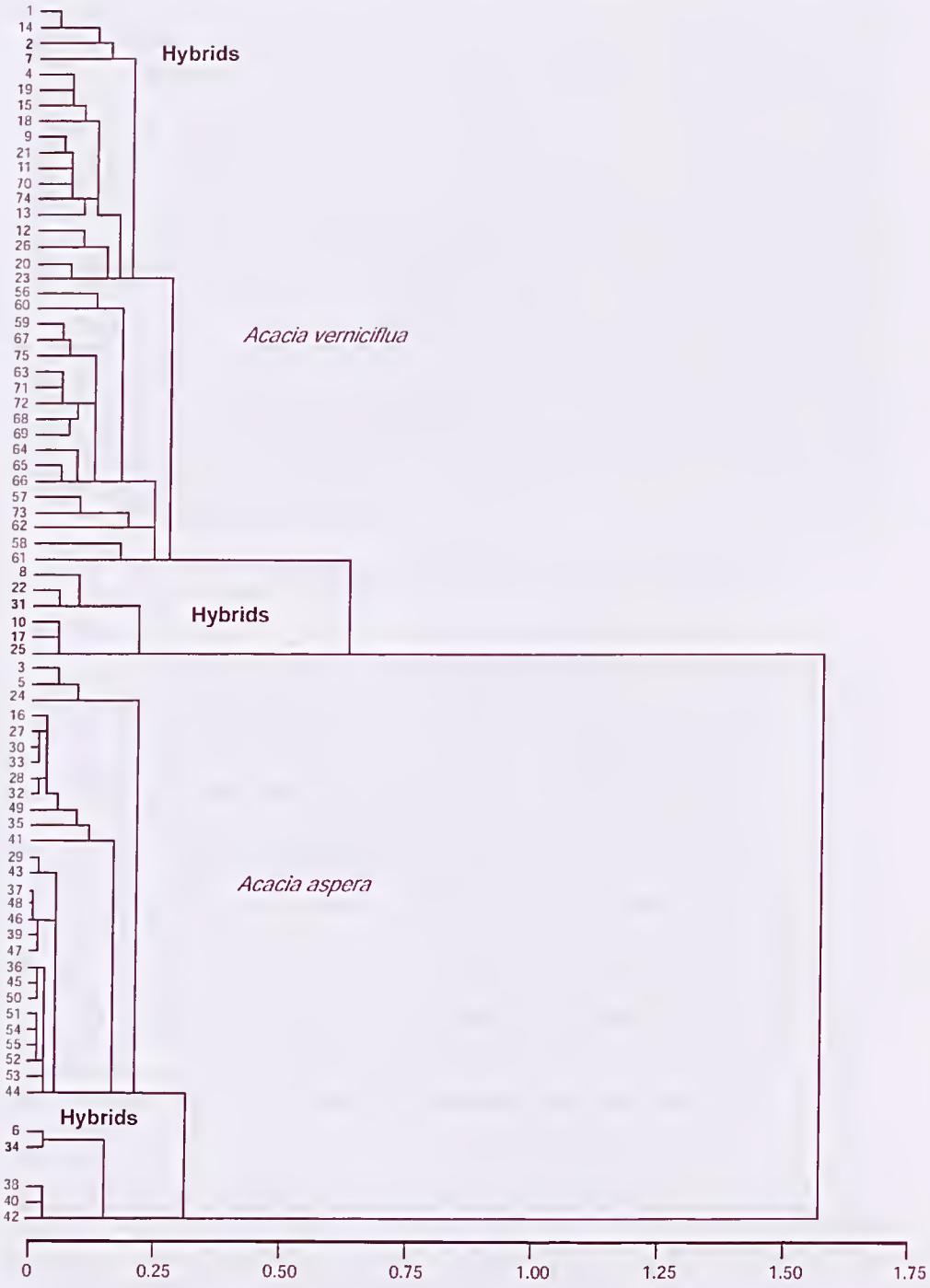

Figure 3. A dendrogram from the agglomerative cluster analysis of 75 specimens (1-35 from the filed site and 36-55 herbarium specimens at MEL). **Suspected hybrids are shown in bold.**

Results

The agglomerative classification (Fig. 3) of all 75 plants (field and herbarium samples) shows three main groups. The groups correspond to *A. verniciflua*, *A. aspera* and a cluster of six intermediate hybrid plants (specimens 8, 10, 17, 22, 25 and 31). This hybrid group clusters at a higher level in the dendrogram with *A. verniciflua* rather than with *A. aspera*. Specimens 2 and 7, categorised in the field as possible hybrids, cluster in the *A. verniciflua* group. Another two specimens thought to be hybrids, 6 and 34, cluster with a subgroup of *A. aspera* (herbarium specimens 38, 40 and 42) that have some phyllodes with two veins in addition to the more typical one-veined phyllodes.

The ordination scatter plot shown in three dimensions (Fig. 4) confirms the three main groups of the dendrogram. All ten suspected hybrids fall in between the two species groups of *A. verniciflua* and *A. aspera*, with specimens 2 and 7 being most like *A. verniciflua* and 6 and 34 being nearer to *A. aspera*. The three herbarium specimens of *A. aspera* from north-east Victoria that had some phyllodes with two veins and some with one vein, form a small cluster next to the main *A. aspera* group.

Phyllode length, width and measure of falcate shape display clearly the intermediacy

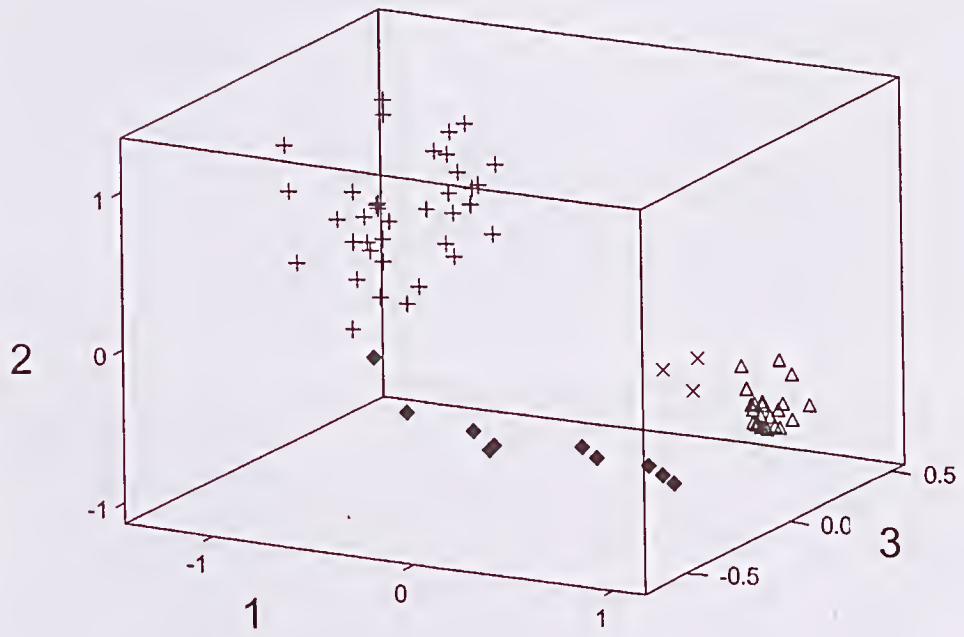

Figure 4. Three dimensional scatter- plot of the 75 specimens, +: *A. verniciflua* group, diamonds: hybrids, triangles: *A. aspera*, x: three herbarium specimens of *A. aspera* from north-east Victoria found to have phyllodes with both 1 and 2 veins.

of the hybrid specimens (Table 2, Fig. 5). The number of main veins for most of the hybrids was variable within the one plant, with some phyllodes having two veins and others only one vein. Whether bracteoles are exserted or not was variable between plants but constant within a plant. The intermediacy of the hybrids is clearly evident in the distribution of unicellular hairs and morphology of glands and glandular trichomes.

Typical of *A. aspera* (Fig. 6a, b) are multicellular glands raised well above the phyllode surface at the tip of a stalk. This contrasts with the presumably homologous but sunken glands of *A. verniciflua* (Fig. 6g), whilst the hybrids had either sessile or shortly stalked glands (Fig. 6c, d, e). The unicellular simple hairs of *A. aspera* are abundant on phyllodes, present but scattered sparsely on the hybrid phyllodes and absent from *A. verniciflua* (Fig. 6a, e, f).

Table 2. Diagnostic characters for parent species and hybrids. Mean values and range (minimum and maximum values) are given.

Character	*A. aspera*	hybrids	*A. verniciflua*
Phyllode length (cm)	1.8 (1.4–2.5)	2.6 (2.3–3.1)	4.8 (2.5–8.5)
Phyllode width (mm)	3 (2–4)	3 (3–3.5)	5 (3–9)
Phyllode curvature (mm)	0 straight	1 intermediate	2–3 subfalcate
Number of main veins	1	1 & or 2	2
Glands stalked or sessile	stalked	sessile or shortly stalked	sessile-sunken
Bracteoles exserted or not	+	+/–	–

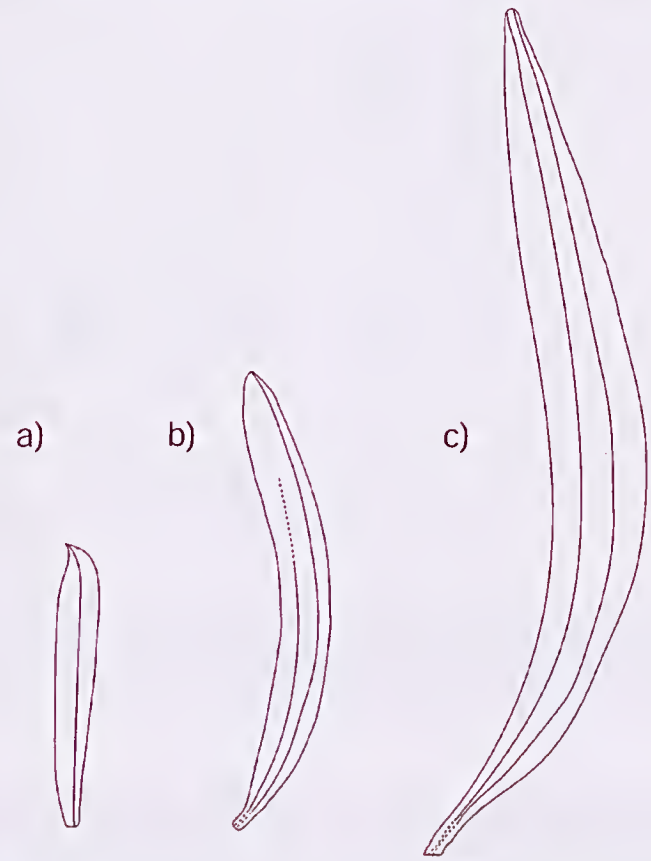

Figure 5. Phyllode shapes of (a) typical *A. aspera* (specimen 35), (b) an intermediate (putative F_1 hybrid, specimen 10) and (c) typical *A. verniciflua* (specimen 14).

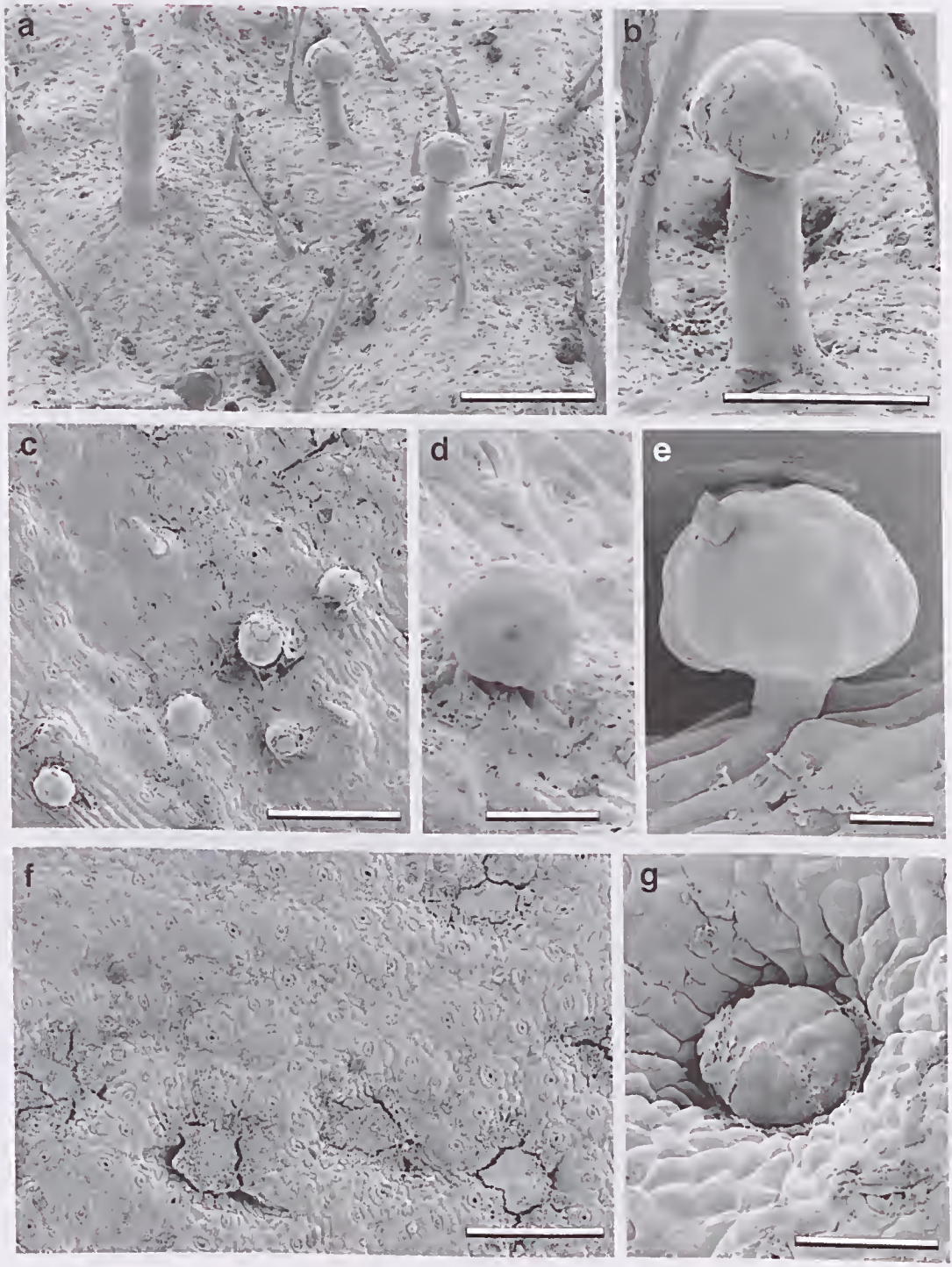

Figure 6. Scanning electron micrographs of the phyllode surfaces of *A. aspera* (specimen 35), a hybrid (specimen 31) and *A. verniciflua* (specimen 23). (a) *A. aspera* stalked resin glands and dense hairs, scale bar = 200mm, (b) at higher magnification, scale bar = 100mm; (c) Hybrid glands and some short hairs of hybrid, scale bar = 200mm, (d) and (e) at higher magnifications, with scale bars =50 and 20mm respectively; (f) *A. verniciflua* with sunken glands covered by resin, which has not dissolved, scale bar = 200mm, (g) sunken gland, scale bar = 50mm.

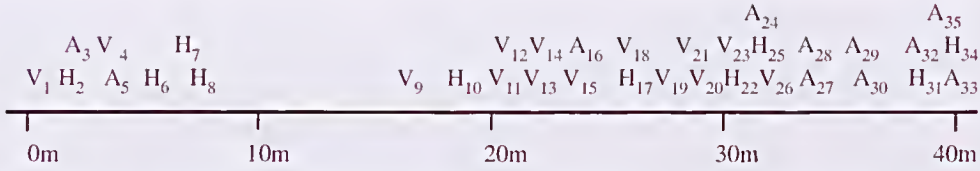

Figure 7. A diagram of the 40m belt transect line showing the relative position of plants sampled in this study; V = *A. verniciflua*, H = hybrids and A = *A. aspera*. Specimen numbers are given beside letters.

Figure 7 illustrates the distribution of the hybrids and the two parent species collected along the transect line at the study site. *Acacia aspera* and *A. verniciflua* are mixed over the study area with hybrids distributed evenly along the 40 metre transect line. For the most part Figure 7 shows that where the hybrids occur there are both *A. aspera* and *A. verniciflua* plants present within a short distance.

Discussion

The morphometric analysis has shown clearly the intermediacy of the suspected hybrid specimens. This supports the hypothesis that six of the field collected specimens are in fact hybrids of *A. aspera* and *A. verniciflua*, probably F_1 progeny. The two suspected hybrids (specimens 2 and 7) that were shown to be more similar to *A. verniciflua* than to the intermediate hybrids may be backcross F_2 progeny. The same explanation is offered for the two suspected hybrids (specimens 6 and 34) that were shown to be more similar to the *A. aspera* group. It is of interest that they were most similar to three herbarium specimens from north-east Victoria that had some phyllodes with two veins, which is suggestive of another instance of *A. aspera* x *A.verniciflua* hybridisation. What controls the development of one or two veins in a single plant requires further examination.

Due to the timing of this study it was not possible to sample flowers, pods or seeds. It is therefore not possible to conclude from this study the fecundity of the hybrids. If the hypothesis that there has been a degree of back crossing is accepted, it would indicate that there is a degree of fertility amongst F_1 progeny.

A link between natural hybridisation and disturbance has long been established (Anderson 1948; Ali & Qaiser 1980; Sedgeley *et al.* 1992; Mayer & Mesler 1993; Hawkins *et al.* 1999). Anderson (1948) put forward the theory of hybridisation of the habitat, which describes the need for an intermediate environment for the survival of the F_1 progeny, and a large amount of variation in the habitat for the survival of a variable F_2 generation. Disturbance of a habitat through the construction of roads may create the micro sites that allow for the establishment of a hybrid swarm (Mayer & Mesler 1993). Such disturbance can create less shading, more water and alter the soil of the area, creating an array of different conditions in which hybrids may grow. The site of the *Acacia* hybrids in the median strip of the Hume Highway is a disturbed site, sunken below the level of the road, acting as a drainage channel. A second site of a possible hybrid swarm further north-east along the Hume highway near Glenrowan has yet to be confirmed.

Conclusion

This study has demonstrated the hybrid status of intermediate plants in a mixed population of *A. verniciflua* and *A. aspera*. This hybrid is a new record for Victoria. Both *A. verniciflua* and *A. aspera* are widely distributed, so the 'genetic purity' of the species is not under great threat. Unless the area is cleared the hybrid population should persist at the site.

Acknowledgments

We thank Daniel Dobrosak for bringing the hybrid location to our attention. We thank Bryan Mole for his assistance with PATN and the phenetic analysis, Ann Bohte for her assistance with SEM, and the National Herbarium of Victoria for access to collections. Our *Acacia* systematics research is supported by an ARC Linkage Grant.

References

Ali, S.I. and Qaiser, M. (1980). Hybridisation in *Acacia nilotica* (Mimosoideae) complex. *Botanical Journal of the Linnean Society* **80**, 69-77.

Anderson, E. (1948). Hybridisation of the habitat. *Evolution* **2**, 1-9.

Belbin, L. (1995). *Pattern Analysis Package (PATN)*. CSIRO Division of Wildlife and Ecology, Canberra.

Bentham, G. (1875). Revision of the suborder Mimoseae. *Transactions of the Linnean Society of London* **30**, *335-664*.

Boughton, V.H. (1989). Trichomes from the foliage of some Australian acacias. *Australian Journal of Botany* **37**, 157-68.

Cheel, E. (1935). The occurrence of hybrid acacias. *Proceedings of the Linnean Society of New South Wales* **60**, 443-446.

Clifford, H.T. and Stephenson, W. (1975). *An introduction to numerical classification*. Academic Press: New York.

Entwisle, T.J., Maslin B.R., Cowan R. S., and Court A.B. (1996). '*Acacia*', in N.G. Walsh and T.J. Entwisle (eds), *Flora of Victoria* **3**, 586 - 656. Inkata Press: Melbourne and Sydney.

Hawkins, J.A., Olaseoaga, L.W., Hughes, C.E., Jimenez, J.L., Ruaro, P. (1999). Investigation and documentation of hybridisation between *Parkinsonia aculeata* and *Cercidium praecox* (*Legumminosae: Caesalpiniodeae*). *Plant Systematics and Evolution* **216**, 46-68.

Leach, G.J. and Whiffin, T. (1978). Analysis of a hybrid swarm between *Acacia brachybotrya* and *A. calamifolia* (Leguminosae). *Botanical Journal of the Linnean Society* **76**, 53-69.

Maslin B.R. (2001). '*Acacia*', in A.E. Orchard & A.J.G. Wilson (eds), *Flora of Australia* **11A**. ABRS/CSIRO Publishing: Melbourne.

Mayer, M.S. and Mesler, M.R. (1993). Morphometrie evidence of hybrid swarms in mixed populations of *Polystichum munitum* and *P. imbricans* (Dryopteridaeeae). *Systematic Botany* **18**, 248-260.

Moffett, A.A., (1956). Genetieal studies in acacias. The estimation of natural erossing in Black Wattle. *Heredity* **10**, 57-67.

Sedgley, M., Harbard, J., Smith, R-M. M., Wiekneswari, R. and Griffin, A.R. (1992) Reproductive biology and interspecifie hybridisation of *Acacia mangium* and *Acacia auriculiformis* A.Cunn. ex Benth. (Leguminosae: Mimosoideae). *Australian Journal of Botany* **40**, 37-48.

Walsh, N.G. (2004) Two new watles endemic to Vietoria. *Muelleria* **19**, 3-8.

Appendix 1

Acacia species	Specimen No.	Collection No.	MEL No.	Location
aspera	36	Beauglehole, A.C. 93423	MEL2022434	10km S.S.E. of Winton
aspera	37	Beauglehole, A.C. 66150	MEL618560	Reef Hill Park
aspera	38	Canning, E.M. 1153	MEL500736	Between Benalla and Wangaratta on Hume Hwy
aspera	39	Hall, N. 79/98	MEL605683	Between Benalla and Wangaratta on Hume Hwy
aspera	40	Hall, N. 79/98	MEL1516433	Hume Highway near Glenrowan
aspera	41	Beauglehole, A.C. 81493	MEL679129	Warby Ranges
aspera	42	Bartolome, M. 193	MEL2155846	16km E.S.E. of Benalla
aspera	43	Fleteher, R.J. 281	MEL2022280	Reef Hill Park
aspera	44	Piesse, A.D.J. 328	MEL1551519	13km N.E. of Benalla on Hume Hwy
aspera	45	Rossiter, N.T. 1	MEL616041	N.E. of Glenrowan
aspera	46	Wallace, G. s.n.	MEL666606	Tarnagulla
aspera	47	Beauglehole, A.C. 69018	MEL618561	4km S.S.E. of Castlemaine
aspera	48	Muir, T.B. 1246	MEL1500071	15 Miles N.E. of Stawell
aspera	49	LeBreton, C. s.n.	MEL234340	Lerderderg Gorge
aspera	50	Clarke, I.C. 2027	MEL1586231	3km W.S.W. of Elphinstone
aspera	51	Walter, C. s.n.	MEL500720	Bendigo
aspera	52	Beauglehole, A.C. 50184	MEL520336	8.5km W.S.W. of Inglewood
aspera	53	Beauglehole, A.C. 50254	MEL520337	27 km N.E. of Stawell
aspera	54	Beauglehole, A.C. 38930	MEL500735	Lightning Hill Reservoir, Bendigo
aspera	55	Beauglehole, A.C.18928	MEL500731	Llanelly
verniciflua	56	Court, A.B. & Willis, J.H.	MEL1529029	5 miles E. of Wilby
verniciflua	57	Fleteher, R.J. 263	MEL2021041	30km S.E. from Wangaratta
verniciflua	58	Piesse, A.D.J. 426	MEL1555746	10.4km S. of Whitfield
verniciflua	59	Willis, J.H. s.n.	MEL502697	Central Summit of Mt. Ida, near Heatheote
verniciflua	60	Crawford, I. 1816	MEL712592	Dookie Agriculture College
verniciflua	61	Fleteher, R.J. 287	MEL2022274	Chiltern State Park, near Cyanide Dam
verniciflua	62	Fletcher, R.J. 288	MEL2022273	Chiltern State Park, near Cyanide Dam
verniciflua	63	Beauglehole, A.C. 80343	MEL679039	Boweya Flora & Fauna Reserve
verniciflua	64	Fletcher, R.J. 289	MEL2022272	Chiltern State Park, near Cyanide Dam
verniciflua	65	Beauglehole, A.C. 92378	MEL2022424	Snowfields, Mt Buffalo Reference Area
verniciflua	66	Beauglehole, A.C. 16962	MEL1516197	Mt. Victory, Grampians
verniciflua	67	Beauglehole, A.C. 16964	MEL563430	Mt. Victory, Grampians
verniciflua	68	Parfett, S.T.W. 56	MEL1537955	200m S.S.E. of Scout Camp, Grampians
verniciflua	69	Beauglehole, A.C. 17456	MEL563429	Grampians
verniciflua	70	Unknown	MEL1529069	Cultivated
verniciflua	71	Hicks, A.J. s.n.	MEL1529027	Rodes Gap, Grampians
verniciflua	72	Muir, T.B. 2146	MEL1529049	32 miles S. of Horsham
verniciflua	73	Court, A.B. s.n.	MEL1516049	Near Chiltern
verniciflua	74	Walter, C. s.n.	MEL1528783	Dandenong Ranges
verniciflua	75	Walter, C. s.n.	MEL1528778	Dandenong Ranges

Muelleria 19: 19–79 (2004)

A revision of the *Thelymitra pauciflora* R.Br. (Orchidaceae) complex in Australia.

Jeffrey A. Jeanes

Royal Botanic Gardens Melbourne, Birdwood Avenue, South Yarra, Victoria 3141, Australia

Abstract

The *Thelymitra pauciflora* R.Br. complex is defined as a group and the Australian members are revised. Fifteen new species, *Thelymitra albiflora* Jeanes, *Thelymitra basaltica* Jeanes, *Thelymitra batesii* Jeanes, *Thelymitra bracteata* J.Z.Weber ex Jeanes, *Thelymitra brevifolia* Jeanes, *Thelymitra cyanapicata* Jeanes, *Thelymitra exigua* Jeanes, *Thelymitra frenchii* Jeanes, *Thelymitra inflata* Jeanes, *Thelymitra lucida* Jeanes, *Thelymitra pallidiflora* Jeanes, *Thelymitra penicillata* Jeanes, *Thelymitra viridis* Jeanes, *Thelymitra vulgaris* Jeanes and *Thelymitra xanthotricha* Jeanes, are described and illustrated. The key diagnostic features relating to the morphology of the post-anther lobe of the column (its size, shape, degree of inflation and degree of apical notching), the lateral lobes (their length, thickness and curvature), the trichomes on the lateral lobes of the column (their distribution, length, number, coarseness and colour), the leaf (its length, width, texture and shape) and the sterile bracts (their number and degree of divergence from the scape) are discussed where relevant. Information on distribution, habitat, flowering time, pollination biology and conservation status is given for all taxa. The relationships between *T. pauciflora* and the other taxa in the complex are discussed. Detailed notes are given on the typification and characterisation of the poorly known species *Thelymitra angustifolia* R.Br., *Thelymitra arenaria* Lindl., *Thelymitra holmesii* Nicholls, *Thelymitra nuda* Fitzg. and *T. pauciflora*. A dichotomous key is provided.

Introduction

Thelymitra J.R.Forst. & G.Forst. is a complex genus of orchids consisting of about 80 described species, several described natural hybrids and at least 30 undescribed taxa. It is concentrated in higher rainfall areas of temperate Australia, but a few species occur in tropical northeastern Australia, about 20 species occur in New Zealand (15 endemic) and a few species occur in Indonesia, New Caledonia, New Guinea and the Philippines.

The complex of taxa surrounding *Thelymitra longifolia* J.R.Forst. & G.Forst. (the type species of *Thelymitra*) is vast, and probably includes about half the total number of species in the genus (Bates 1999). The first botanist to study the genus in any detail was Robert Brown (1810), who described three new species in the *T. longifolia* complex—*Thelymitra angustifolia* R.Br., *Thelymitra nuda* R.Br. and *Thelymitra pauciflora* R.Br. from eastern Australia. Lindley (1840a & 1840b) described a further four new species—*Thelymitra arenaria* Lindl., *Thelymitra graminea* Lindl., *Thelymitra macrophylla* Lindl. and *Thelymitra versicolor* Lindl. (the latter I regard as a synonym of *T. nuda*), two of these species from the eastern States and two from Western Australia. Bentham (1873) took an extraordinarily conservative approach by recognising only *T. longifolia* as a valid species, while relegating *T. arenaria*, *T. graminea*, *T. nuda*, *T. pauciflora* and *T. versicolor* to synonymy under that species, *T. angustifolia* to synonymy under the unrelated *Thelymitra aristata* Lindl. and *T. macrophylla* as a taxon linking *T. aristata* to *T. longifolia*. Most botanists and authors that have dealt with the genus since Bentham, acknowledged that there are several to many distinct species involved (e.g. Fitzgerald 1875–95, Nicholls 1969, Jones 1988, Clements 1989, Bernhardt 1993, Backhouse & Jeanes 1995 and Jones & Clements 1998b). In recent times a steady stream of new taxa has been described in the complex—*Thelymitra fragrans* D.L.Jones & M.A.Clem. (Jones & Clements 1988), *Thelymitra malvina* M.A.Clem., D.L.Jones & Molloy (Clements

1989), *Thelymitra granitora* D.L.Jones & M.A.Clem. (Jones & Clements 1998a), *Thelymitra gregaria* D.L.Jones & M.A.Clem. (Jones & Clements 1998a), *Thelymitra imbricata* D.L.Jones & M.A.Clem. (Jones & Clements 1998b), *Thelymitra atronitida* Jeanes and *Thelymitra planicola* Jeanes (Jeanes 2000).

Taxa in the *T. longifolia* complex generally have unspotted blue flowers (less often white or pink) varying in size from about 10 mm to 50 mm in diameter when fully open. The post-anther lobe of the column is tubular, variously inflated, smooth on the dorsal surface, variously open on the ventral side and entire, emarginate or deeply bifid at the apex. The auxiliary lobes are at most rudimentary, consisting of a pair of tiny incurved spurs on the lower apical margin of the post-anther lobe, or more often completely absent. The two finger-like lateral lobes extend forward from the column wing, one on each side of the anther and just below the post-anther lobe. These may be more or less straight, curved gently or bent upwards at right angles near the middle. Each lateral lobe has a tuft of white trichomes (less often yellow or mauve) that may be elongate resembling a toothbrush or short and more or less terminal resembling a mop.

Thelymitra longifolia appears to be endemic to New Zealand as I have seen no specimens collected outside that country that are a good match for the type material. Australian members of the *T. longifolia* complex are often divided conveniently, but rather arbitrarily, into two smaller complexes on the basis of flower size and pollination biology. Members of the so-called *T. pauciflora* complex have small flowers (perianth segments usually to 10 mm long, sometimes as long as 12 mm and rarely reaching or exceeding 15 mm) that are usually unscented, generally autogamous and often also cleistogamous. Members of the so-called *T. nuda* complex generally have larger flowers (perianth segments on mature plants are usually more than 15 mm long and sometimes as long as 25 mm) that open more readily, are often scented and are pollinated by native bees (melittophilous). This latter group will be dealt with elsewhere.

The two complexes are probably artificial as several taxa could be placed in either group based on flower size and *T. malvina* appears to produce both insect-pollinated and autogamous clones. Also, initial phylogenetic studies based on molecular analyses do not support either of these complexes as being natural groups (M.A.Clements pers. comm.).

At the outset of this study, eight species were recognised in the *T. pauciflora* complex in Australia—*T. angustifolia*, *T. arenaria*, *T. atronitida*, *Thelymitra holmesii* Nicholls, *T. malvina*, *Thelymitra uncida* Fitzg., *T. pauciflora* and *T. planicola*. It became evident during this study that there are many more than just these eight species present. The differences between the species are often subtle and may only become evident after close scrutiny of fresh flowers with a hand lens or a microscope.

Traditionally, the column has provided the main suite of characters used to distinguish between the species in *Thelymitra*. To a large degree this remains true for this study, but vegetative characters are often also useful and must be taken into account. For example, *Thelymitra brevifolia* Jeanes can be identified with a high degree of confidence from mature leaves alone. The number of sterile bracts can also sometimes be a useful guide to help distinguish species such as *T. angustifolia* or *T. planicola*. Other features that can help distinguish the species relate to the colour of the flowers, the colour of the various parts of the column, habitat preference and flowering time.

The various members of the *T. pauciflora* complex have a propensity to hybridise with other *Thelymitra* species, both inside and outside the group, making positive identification of some plants extremely difficult.

Explanation of the terminology used

The genus *Thelymitra* is unusual in the Orchidaceae in that the six perianth segments generally differ very little from each other in terms of size, shape and ornamentation. The labellum does not bear any hairs, calli, glands, ridges, lobes, teeth or fringes and is

apparently not involved in pollination. Since the perianth is virtually actinomorphic and generally lacks characters by which to distinguish the species, traditionally the structure of the column has supplied most of these distinguishing characters. Over the years a terminology has evolved to describe the column structure in *Thelymitra*, but some of these terms are poorly understood and some have never been defined adequately. Below is an explanation of some of the terms commonly used in this paper; most have a traditional usage although this has often not been well understood while others are used for the first time.

Column (gynostemium): The column is exposed in the centre of the flower, it lacks a free filament and style, is short and thick and broadly winged from below the stigma to the level of the anther or beyond. The apex is usually 3–5-lobed and is often ornamented with trichomes, fringes, teeth, calli, glands, tubercles or lobes. In members of the *T. pauciflora* complex the apex of the column is more or less tri-lobed with trichomes adorning the two lateral lobes.

Post-anther lobe (mid-lobe): This structure lies beyond the point of insertion of the anther and of the lateral lobes, and it is usually of a different colour to the rest of the column. It has a complex vascular supply always associated with that of the functional anther and may be regarded as an outgrowth of the filament. In some species it is represented only by a short flap or a band of small calli crowded across the back of the anther. In most species it extends well beyond the anther with a free margin that may be plain, undulate, toothed, notched or variously ornamented with tubercles. At its maximum development (such as in the *T. pauciflora* complex) it forms a fleshy, tubular hood that is variously open on the ventral side and overhangs and obscures the anther. The apex of this tube is usually bright yellow and is often variously cleft into two distinct lobes that have shallowly toothed and often thickened margins.

Inflation of the post-anther lobe: In the literature the post-anther lobe has often been described as 'inflated', particularly in reference to some members of the *T. pauciflora* and *T. nuda* complexes. In this account the term inflated is used in relation to those taxa in which the shape of the post-anther lobe is noticeably bulbous and is discontinuous with the shape of the column lower down. This is often obvious when viewing the column in profile, but is usually more evident when viewing it from above and behind.

Post-anther lobe extension: This term is used in this account for the distance that the post-anther lobe extends beyond the point of insertion of the lateral lobes. This measurement varies considerably from taxon to taxon and is sometimes useful in helping to define the species.

Post-anther lobe orifice: In the *T. pauciflora* complex the orifice at the apex of the post-anther lobe varies considerably in size and shape. It may be more or less circular, narrow-elliptic or just a slit depending upon the degree of notching and dorsal compression of the post-anther lobe. In most species the orifice is rather large, indicating that the post-anther lobe does not contract greatly towards the apex. In a few species (e.g. *T. malvina*) the orifice is quite small, indicating a significant contraction in the post-anther lobe towards the apex.

Lateral lobes (column-arms or lateral staminodes): These two structures lie one each side of the post-anther lobe and of the anther and extend forward or upward and often converge. They are each supplied by a single unbranched vascular bundle and are thought to represent staminodes. They may be flat and ribbon-like, terete and finger-like, straight, curved, twisted spirally or bent sharply, and are usually ornamented with lobes, teeth, tubercles or trichomes. The lateral lobes are finger-like and trichomic in members of the *T. pauciflora* complex, but may be straight, curved gently, bent sharply, parallel or convergent.

Trichomes: These are the hair-like structures present on the lateral lobes of many *Thelymitra* species, including those in the *T. pauciflora* complex. They are each 1–2 cells wide throughout their length and may be thickened and glandular at the apex. They may extend along nearly the entire length of the lateral lobe in a toothbrush-like arrangement, or be concentrated mainly in the distal half in a more mop-like arrangement. In some species adjacent trichomes may be partially connate at the base. The trichomes are usually white, but may be mauve, pink, cream or yellow in some species.

Auxiliary lobes (accessory lobes or side lobules): Several species of *Thelymitra* have a pair of distinct lobes between the post-anther lobe and the lateral lobes. These have no vascular strand and are most accurately described as being part of a tripartite post-anther lobe. They tend to be fleshy with irregularly jagged margins and sometimes have small surface tubercles. In the *T. pauciflora* complex the auxiliary lobes are often completely absent or they may be reduced to a pair of small incurved spurs or bumps on the distal margin of the post-anther lobe.

Anther: In *Thelymitra*, the anther is usually small, ovoid, and situated entirely between the column wings. The connective extends beyond the pollinia into an apical beak-like projection of varying size. The anther may be entirely above the stigma or variously obscured behind it. In the *T. pauciflora* complex the anther is usually inserted about half way along the column and is most often entirely above the stigma.

Pollinia: Members of the genus *Thelymitra* contain four pollinia in two groups of two. In the *T. pauciflora* complex the pollinia are loosely bound and friable, with the monad pollen grains often scattered about the column even on flowers that have not yet opened naturally.

Stigma: The stigma in *Thelymitra* is more or less bi-lobed at the apex, usually quadrate or transverse-elliptic in shape and located at the base of the column on a thick stalk.

Materials and methods

This paper is the result of a qualitative and quantitative study of the pertinent type material (or photographic reproductions thereof), many hundreds of herbarium specimens (both dry and spirit-preserved) from AD, BM, BRI, CANB, E, HO, MEL, NSW, P, PERTH, QRS, SUNIV and WELT, and numerous freshly collected specimens, all of which were vouchered and deposited at the relevant herbaria. Orchid taxa in general, and *Thelymitra* taxa in particular, are much more readily identified from fresh living material where characters of the perianth, the column, flower colour and fragrance are still intact. Familiarity with the taxa gained from field study and the study of freshly collected specimens sent to me by field operatives has made the identification of dried and spirit-preserved herbarium material (including type specimens) much easier. In fact, several distinct taxa were discovered during field work and during the examination of fresh material that, although represented in the preserved collections, would probably have been overlooked due to the loss or degradation of important diagnostic information on drying or spirit preservation.

When collecting *Thelymitra* for study it is essential that the entire above ground parts of the plant are taken, with the majority of the material being preserved in spirit. Plants preserved in the pressed state are often difficult to identify to species level in the absence of additional information. Spirit preserved specimens on the other hand, are generally much more easily identified to species level. The observation of plants growing *in-situ* is the ideal method of study for *Thelymitra* in general, and often it is only by this method that cryptic new species can be identified. For this reason the importance of field work in the study of species complexes within *Thelymitra* cannot be overstated and should form an integral part of any future studies of the group. It is likely that other taxa worthy of

recognition exist within this large and diverse complex, but adequate information and collections of these are lacking at present.

Taxonomy

Key to the known members of the *T. pauciflora* complex in Australia.

1. Post-anther lobe covered with a glaucous or glistening bloom 2
1. Post-anther lobe lacking bloom 4
2. Post-anther lobe narrow at the base and widest towards the apex; trichomes on the lateral lobes usually 1.2–2.2 mm long, sparse, often connate at the base, 0.05–0.1 mm thick, usually bright yellow, strongly embracing the apex of the post-anther lobe; southern Australia ..... **19. *T. mucida***
2. Post-anther lobe widest near the middle and narrowing only slightly above and below; trichomes on the lateral lobes usually 1–1.6 mm long, congested, not connate at the base, <0.05 mm thick, white or creamy yellow, not strongly embracing the apex of the post-anther lobe; southeastern Australia 3
3. Post-anther lobe somewhat inflated, mostly black with a yellow apex, covered with a thin sparkling bloom, bilobed, the lobes 1.2–1.6 mm long; trichomes on the lateral lobes 1–1.2 mm long, usually white, sometimes cream; plants from swampy habitats, often in standing water at anthesis; flowering season mid-November to mid-December ..... **20. *T. lucida***
3. Post-anther lobe very inflated, mostly pinkish or brown grading into yellow at the apex, covered with a thick, waxy bloom, deeply bilobed, the lobes 1.5–2.5 mm long; trichomes on the lateral lobes 1.2–1.6 mm long, usually cream or yellow; plants from dry to moist woodland habitats, rarely in standing water at anthesis; flowering season late September to mid-November ..... **21. *T. inflata***
4. Trichomes on the lateral lobes usually cream or yellow, proximal trichomes often pinkish, at least basally 5
4. Trichomes on the lateral lobes usually entirely white, rarely mauve 7
5. Post-anther lobe very inflated, mostly pinkish or brown grading into yellow at the apex, deeply bilobed, the lobes more or less parallel, 1.5–2.5 mm long **21. *T. inflata***
5. Post-anther lobe somewhat inflated, mostly dark brown or black with a distinct yellow apex, bilobed, the lobes usually diverging, 0.8–1.5 mm long 6
6. Perianth segments usually 8–11 mm long; trichomes on the lateral lobes 1.2–1.8 mm long, rather sparse and of an untidy appearance; flowering season mostly November and December; southeastern Australia only ..... **22. *T. holmesii***
6. Perianth segments usually 12–15 mm long; trichomes on the lateral lobes 1–1.5 mm long, very dense and of a neat appearanee; flowering season mostly late September and Oetober; southwestern Australia only ..... **23. *T. xanthotricha***
7. Post-anther lobe more or less ereet, not eurved forward; plant to 14 em tall; flowers 1–3; lower sterile braet entire or deeply bifid; roek outerops in Western Australia .... **18. *T. frenchii***
7. Post-anther lobe eurved forward through e. 90°; plant usually >14 em tall; flowers often more than 3; lower sterile bract entire 8
8. Post-anther lobe semi-eylindrie, widely open on the ventral side; sterile bracts up to 4, lower ones often leaf-like ..... **14. *T. planicola***
8. Post-anther lobe not as above; sterile bracts usually 1, 2 or 3, none of them leaf-like 9
9. Leaf laneeolate (at least on mature plants), usually less than half the height of the inflorescence and often much shorter, blade more or less flat and thin-textured, frequently with dark reddish margins, veins and suffusions; post-anther lobe often deeply and irregularly slit at the apex into 2 parallel lobes, usually orange-brown or bright reddish orange ..... **3. *T. brevifolia***

9. Leaf linear to linear-lanceolate, usually fleshy and canaliculate (except in *T. angustifolia*), mostly more than half the height of the inflorescence; post-anther lobe sometimes v-notched but not irregularly slit at the apex, usually brown to black with a yellow tip, rarely all blue 10
10. Post-anther lobe strongly compressed dorsally in the distal half, apical orifice small; trichomes white or mauve 11
10. Post-anther lobe not as above; trichomes white 12
11. Post-anther lobe mostly glossy black; trichomes white; sterile bracts usually 2; flowers pale blue ..... **10. *T. atronitida***
11. Post-anther lobe dark reddish brown; trichomes usually pink or mauve, rarely white; sterile bracts usually 3; flowers slate blue to purplish ..... **11. *T. malvina***
12. Lateral lobes not glabrous at the base, with trichomes extending more or less along their entire length in a toothbrush-like arrangement 13
12. Lateral lobes glabrous in at least the basal 1/4 to 1/2, with trichomes in a more or less terminal mop-like arrangement 20
13. Perianth segments often more than 12 mm long; mature plants tall and stout; flowers more than 8 on at least some mature plants 14
13. Perianth segments rarely more than 12 mm long; mature plants rather small and slender; flowers rarely more than 8 even on mature plants 16
14. Post-anther lobe deeply v-notched, black with a yellow apex; flowers white or very pale blue; sterile bract usually solitary; near coastal Victoria only ... **9. *T. pallidiflora***
14. Post-anther lobe emarginate, brown with a yellow apex; flowers usually blue or purplish; sterile bracts usually two 15
15. Lower pedicels often partially decurrent on rachis; sepals mostly green on external surface; base of upper sterile bract often only half encircling the scape; sterile bracts to 15 cm long; fertile bracts to 35 mm long ..... **8. *T. bracteata***
15. Pedicels never decurrent on rachis; sepals mostly purplish on external surface; base of upper sterile bract usually scape-encircling; sterile bracts to 8.5 cm long; fertile bracts to 22 mm long ..... **16. *T. arenaria***
16. Post-anther lobe narrowest at the base and broadest towards the apex, deeply v-notched; southwest Western Australia ..... **15. *T. vulgaris***
16. Post-anther lobe usually broadest near the middle, narrowing only slightly above and below, emarginate to shallowly v-notched; southeastern Australia 17
17. Plants short and stout, often forming clumps apparently by vegetative reproduction; leaf nearly as long as, or longer than, inflorescence; lowest fertile bract often with proximal margins connate 18
17. Plants slender, not clumping; leaf much shorter than the inflorescence; fertile bracts with margins entirely free; South Australia 19
18. Leaf very thick, fleshy and brittle, as long as or longer than inflorescence ..... **4. *T. basaltica***
18. Leaf moderately fleshy, flexible, shorter than inflorescence ..... **2. *T. exigua***
19. Flowers 1–10, usually white; post-anther lobe reddish brown with a yellow apex; trichomes on lateral lobes in elongate tufts ..... **6. *T. albiflora***
19. Flowers 1–3, usually blue; post-anther lobe entirely dark blue; trichomes on lateral lobes in subglobose tufts ..... **7. *T. cyanapicata***
20. Leaf 75% of the height of the inflorescence or longer 21
20. Leaf less than 75% of the height of the inflorescence 22
21. Plant with an overall pale greenish appearance; leaf fleshy; sterile bracts usually 2; post-anther lobe shallowly v-notched at the apex; flowers late October to early December; near-coastal Tasmania only ..... **5. *T. viridis***
21. Plant without an overall pale greenish appearance; leaf thin-textured; sterile bracts usually 3; post-anther lobe usually deeply bilobed at the apex; flowers June to October; Queensland and northern New South Wales ..... **13. *T. angustifolia***

22. Flowers usually 1–3, most often pale blue; lateral lobes 0.5–1 mm long, bent sharply upwards at c. 90° near the middle; post-anther lobe entire or emarginate .... **1. *T. pauciflora***
22. Flowers usually 4–10, most often mauve or deep purplish blue; lateral lobes 1.2–1.5 mm long, curved gently upwards; post-anther lobe often deeply bilobed at the apex 23
23. Exterior of sepals pink with darker longitudinal striations; mature flower buds inflated, subacute at apex; leaf usually less than 10 mm wide; hill country of South Australia ..... **17. *T. batesii***
23. Exterior of sepals not as above; mature flower buds not inflated, acute at apex; leaf often more than 10 mm wide; widespread in southeastern Australia .... **12. *T. peniculata***

1. *Thelymitra pauciflora* R.Br., *Prodr.* 314 (1810).

Type: Between Sydney and Parramatta, moist meadows, Port Jackson, ix.–x. 1803, *R. Brown s.n.* (lectotype α BM!, *fide* Clements 1989; isolectotypes BM!, E!); *Syntypes*: Port Jackson between Sydney and Parramatta, ix., *R. Brown s.n.* (BM!, E!); Sydney, x.–xi. 1803, *R. Brown s.n.* (BM!).

Illustrations: Fitzgerald (1880) 1: 6; Nicholls (1969) Plate 23, fig. a; Jeanes & Backhouse (2001) page 170 fig. A.

Glabrous terrestrial *herb*. *Tubers* ovoid, 1–2 cm long, 5–10 mm wide, fleshy. *Leaf* linear, (8–)15–30 cm long, 3–6 mm wide, erect, fleshy, canaliculate, dark or light green with a purplish base, ribbed abaxially, sheathing at base, apex acute to acuminate. *Inflorescence* 15–50 cm tall, 1–1.5 mm diam., slender, straight, green to purplish. *Sterile bracts* usually 1 or 2, rarely 3, linear to linear-lanceolate, 1.5–5 cm long, 3–5 mm wide, closely sheathing, acute to acuminate, green to purplish. *Fertile bracts* ovate-acuminate to obovate-acuminate, 4–15 mm long, 2–5 mm wide, sheathing the pedicels, green to purplish. *Pedicels* 1–10 mm long, slender. *Ovary* narrow-obovoid, 5–12 mm long, 2–4 mm wide. *Flowers* 1–3(–5), 15–20 mm diameter, usually pale blue, less often pink or white, opening tardily on warm to hot days. *Perianth segments* 6–10 mm long, 3–5 mm wide, concave, often shortly apiculate; *dorsal sepal* lanceolate to ovate, obtuse to subacute; *lateral sepals* lanceolate to ovate, often asymmetric, acute; *petals* ovate to obovate, obtuse to subacute; *labellum* elliptic to lanceolate, acute, often smaller than other segments. *Column* erect from the end of ovary, 4–5 mm long, 2–2.5 mm wide, white to pale blue or pale pink; *post-anther lobe* hooding the anther, 1.8–2.5 mm long, 1–1.5 mm wide, tubular, gently curved, usually brown or reddish brown, apex entire to emarginate, yellow; *post-anther lobe extension* 0.4–0.7 mm; *auxiliary lobes* absent or sometimes present as 2 tiny incurved spurs on the lower apical margin of the post-anther lobe; *lateral lobes* converging, 0.5–1 mm long, digitiform, porrect at base, bent sharply upwards near the middle at c. 90°, each with a sub-terminal mop-like tuft of white trichomes that touch the ventral side of the apex of post-anther lobe, the individual trichomes 0.5–1.1 mm long. *Anther* inserted above centre of column, ovoid, 2–2.5 mm long, 1–1.5 mm wide, the connective produced into an apical beak 0.4–0.6 mm long; *pollinarium* 1.4–2 mm long; *viscidium* more or less circular, c. 0.5 mm diam.; *pollinia* mealy, friable, white. *Stigma* situated at base of column, ovate-quadrate, 1.5–2 mm long, 1.5–2 mm wide, margins irregular. *Capsules* obovoid, 8–15 mm long, 3–6 mm wide, erect, ribbed. (Fig. 1 a–c; Plate 1. Fig. 9)

Selected specimens examined: South Australia: Northern Lofty Region: Hughes Park, via Sevenhill, x. 2000, *R.J. Bates 57679* (MEL *2100135*); Kangaroo Island Region: Penneshaw–Kingscote Road, c. 8 km S of American River turnoff, 12 viii. 1993, *D.L. Jones 11885 & B.E. Jones* (CANB *9706994*); Southeast Region: c. 20 km NE of Naracoorte, 20 x. 1997, *K.*

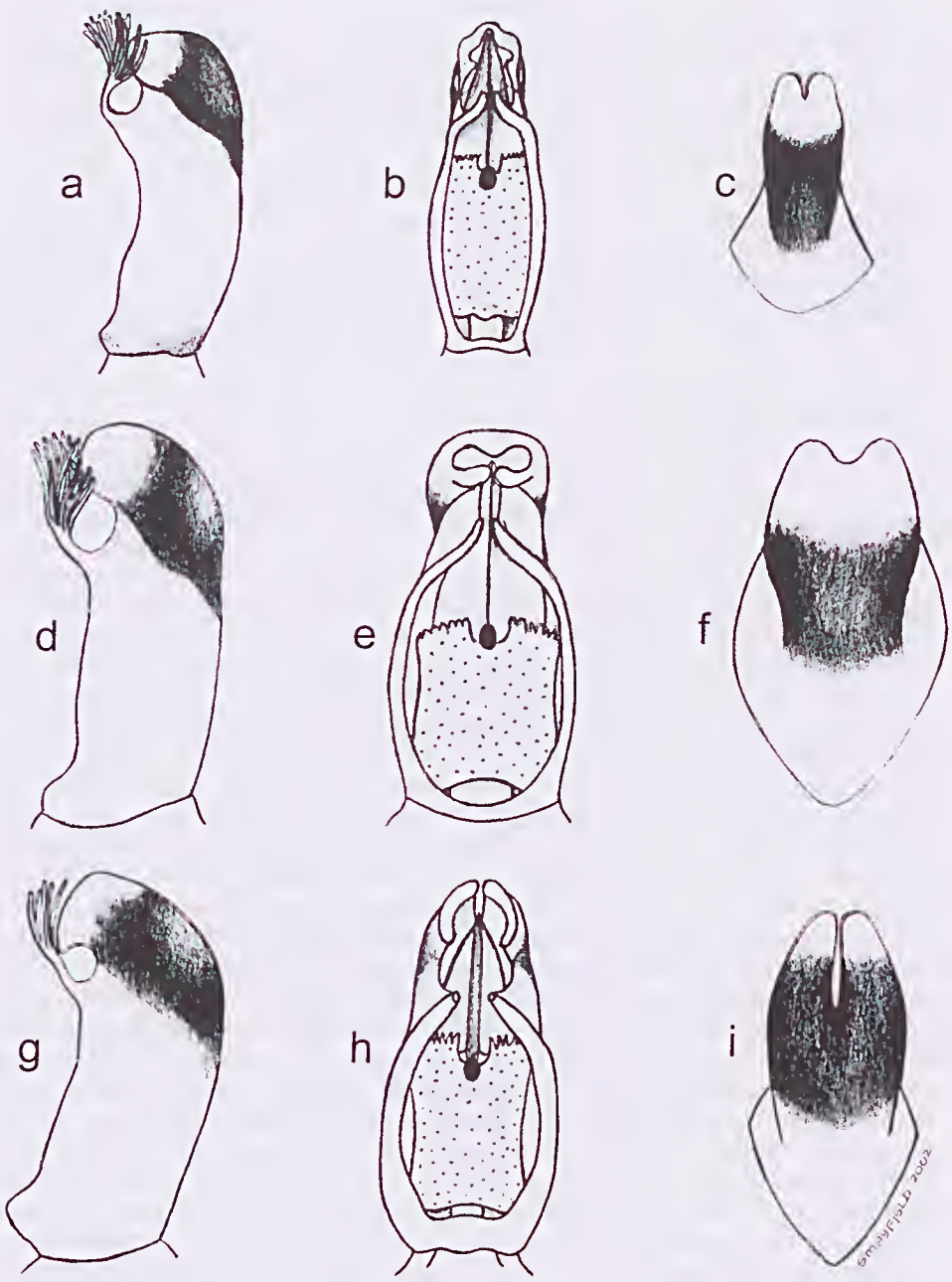

Figure 1.
Thelymitra pauciflora: **a** column from side × 10; **b** column from front × 10; **c** post-anther lobe from rear × 10
Thelymitra exigua: **d** column from side × 10; **e** column from front × 10; **f** post-anther lobe from rear × 10;
Thelymitra brevifolia: **g** column from side × 10; **h** column from front × 10; **i** post-anther lobe from rear × 10

Alcock DLJ15636 (CANB *9908934*); Southern Lofty Region: Blackwood district, x. 1953, *R. Nash s.n.* (CANB *8104526*); Eyre Peninsula Region: Warilla, 27 ix. 1986, *M.A. Clements 4265* (CANB *8605411*); 97 Cove Avenue, Bridgewater, 9 xi. 1989, *J.Z. Weber 10201* (MEL *289488*); Southern Lofty Region: Forest Range, 20 x. 1968, *M.R. Pocock 132* (AD *MRP132*); Southern Lofty Region: Littlehampton, 24 x. 1907, *R.S. Rogers s.n.* (AD *97721136*);); Southern Lofty Region: Myponga, 25 x. 1931, *Dr & Mrs Rogers s.n.* (AD *97721142*); Fleurieu Peninsula: c. 1 km N of Normanville Township, 16 x. 1967, *T. Smith 855* (AD *96938072*). QUEENSLAND: Girraween National Park, 17 x. 1996, *R. Crane 1721* (BRI *656629*); Stanthorpe, 15 x. 1987, *R.J. Bates 11066* (AD *98746541*). NEW SOUTH WALES: Southwest Slopes: Nailean Range, Albury, 17 x. 1998, *P.G. Branwhite ORG1643* (CANB *609311*); Within 100 m to the S of Leuna Ave, Fox Valley, 23 ix. 1988, *P.H. Weston 1243 & A.D. Bishop* (NSW *209969*); Beecroft Peninsula, near Kinghorn Point, 28 ix. 1987, *K. Egerod 87347* (NSW *462474*); Central-west Slopes: Top Creek Property, c. 27.5 km NNW of Boorowa, 30 x. 1985, *P. Beesley 504, I. Gleadhill & B. Rimes* (CANB *850432*4); Central Coast: Western Yeramba Lagoon, near Picnic Point, 22 x. 1990, *R. Miller DLJ6780* (CANB *9016251*); North Coast: Yuraygir National Park turnoff, c. 1 km from Pacific Highway, 31 viii. 1989, *D.L. Jones 4901 & M.A. Clements* (CANB *8913433*). AUSTRALIAN CAPITAL TERRITORY: Brindabella Ranges, c. 6.3 km W of junction of Mt Franklin and Brindabella Valley Roads, 24 xi. 1991, *D.L. Jones 8552 & B.E. Jones* (CANB *9803943*); Black Mountain on NW slope, 7 xi. 1975, *B. Hain 78* (CANB *61930*). VICTORIA: Mt Morton, 14 x. 1967, *D.L. Jones s.n.* (CANB *8104540*); Warby Range, 3.2 miles from Wangaratta Cemetery turnoff, Hume Highway, 25 x. 1967, *E.M. Canning EMC113* (CANB *33722*); Wattle Glen, Moonlight Road, 1.1 km from its junction with Flat Rock Road, 8 x. 1973, *T.B. Muir 5175* (CANB *8309406*); 'Jindalee', Greta West, 8 x. 1999, *J.R. Hosking 1771* (MEL *294410*); 3.4 km W of Mackillop's Bridge, Snowy River region, 14 xi. 1993, *S.M. Prober s.n.* (CANB *492578*): Gippsland Highlands: Darlimurla area, c. 500 m W of Darlimurla Railway Station beside old rail line, 8 xi. 2000, *J.A. Jeanes 936* (MEL *2087448* & MEL *2089312*); Enfield Forest Park, Berringa–Misery Creek Road area, c. 27 km SSW of Ballarat, 25 x. 1978, *A.C. Beauglehole 61079* (MEL *1530882*); Wannon: Mt Richmond, West Spring Track, N end, 1 xi. 1991, *T.J. Entwisle 2101* (MEL *2018756*). TASMANIA: Near Naracoopa tip, King Island, 5 xi. 1991, *D.L. Jones 8468* (CANB *9803868*); Old Waterhouse Rd, 8 xi. 1992, *J. Campbell 92176* (CANB *612478*); Clarkes Island, Robin Hill, 7 xi. 1979, *J.S. Whinray 2260* (MEL *594272*); Sandspit River at base of Blue Gum Spur, 22 xi. 1984, *M.J. Brown 474* (HO *412448*); Close to the Tasman Highway S of Elephant Pass and a few km N of Piecaninny Creek, 6 xi. 1985, *L. Rubenach s.n.* (HO *95782*); N of Coles Bay, 6 xi. 1985, *L. Rubenach s.n.* (HO *96781*); Banana Ridge, 20 km NNW of Lady Barron, Flinders Island, 26 x. 1990, *P. Collier 4864* (HO *127022*); Lime Bay Nature Reserve, Tasman Peninsula, 3 xi. 1984, *P. Collier 11/12* (HO *99516*).

Distribution and habitat: South Australia, Queensland, New South Wales, Australian Capital Territory, Victoria, Tasmania (Fig. 11) and New Zealand. Grows in a wide variety of habitats including open forest, woodland, heathy woodland, heathland, grassland and coastal scrublands usually on well-drained sand and clay loams. Altitude: 0–1000 m.

Conservation status: Widespread, often locally common and well conserved.

Flowering period: September to November.

Pollination biology: This species is facultatively autogamous and often also cleistogamous.

Typification: The type sheet contains nine specimens and two labels showing different origins and dates, which is why Clements (1989) selected specimen 'a' as the lectotype. All the plants are, however, of fairly consistent appearance and apparently represent a single taxon.

Brown's Latin description (Brown 1810): *T. pauciflora*, cucullo perianthio patulo dimidio breviore: laciniis extimis penicillatis: intermediâ dorso nudo emarginatâ lobulis rotundatis integris, spicâ pauciflorâ. (hood shorter than half the widely spread perianth: side lobes penicillate: post-anther lobe naked, emarginate, lobules rounded, entire, spike few-flowered.)

Notes: Plants consistent with Brown's description of *T. pauciflora* and with the specimens on the type sheet still occur near Sydney and have been collected recently and

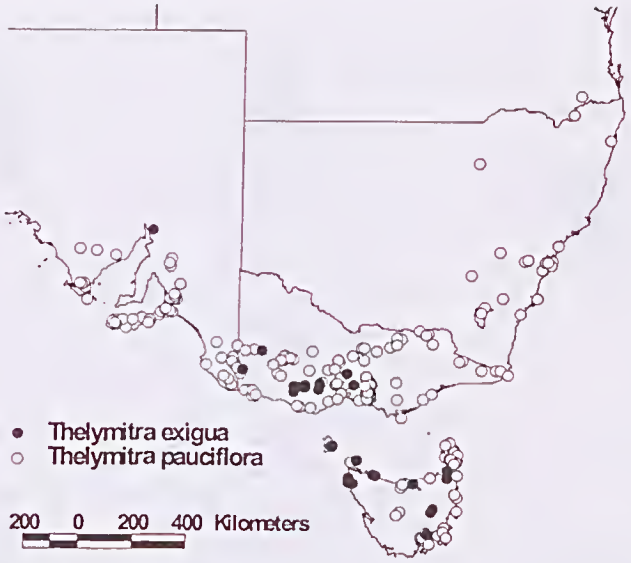

Figure 11. Distribution of *Thelymitra exigua* and *Thelymitra pauciflora*.

studied. This taxon appears to be relatively common and widespread throughout much of southeastern Australia. However, *T. pauciflora* remains poorly known today due to the presence of many taxa that bear several features in common with the type, but may also differ from it in subtle ways. Several characters can be used in combination to define *T. pauciflora sensu stricto*. At lower elevation it flowers primarily in October and usually prefers to grow in open forests on drier clay or sandy loam soils. The leaf is long, narrow and fleshy, rarely exceeding 6 mm wide and the scape is slender and up to 50 cm tall, usually with two sterile bracts. There are usually only one to three (but sometimes as many as five) flowers that are autogamous (sometimes also cleistogamous) and will open tardily only on very warm to hot days. The perianth segments are usually up to 10 mm long, and about half as wide, pale blue or, less often, pink or white in colour. The post-anther lobe is more or less tubular (widely open on the ventral side), not inflated, and the apex is entire or emarginate. The lateral lobes are usually up to 1 mm long and bend upwards sharply (at c. 90°) near their middle. The trichomes on the lateral lobes are usually up to c. 1 mm long and are arranged in very dense sub-terminal mop-like bundles that touch the underside of the tip of the post-anther lobe.

It is interesting to note that several collections seen by me from New Zealand (on loan from WELT) are a good match for the type material of *T. pauciflora*.

2. *Thelymitra exigua* Jeanes *sp. nov.*

T. pauciflorae R.Br. affinis sed plantis brevioribus crassioribus caespitiformantibus generatum, folii latiore saepe scapo aequante, bractea sterili plerumquo solitaria, et inflorescentia densiore floridiore differt.

Type: Victoria. Voleanie Plain Region: N side of Chatsworth Rd c. 2 km E of Woorndoo, 8 x. 1999, *J.A. Jeaues 567, C. & M. Trigg* (holotype MEL; isotype CANB).

Illustration: Jeanes & Backhouse (2001) page 170 figs B (top) & E. (as *T. pauciflora*).

Glabrous, clumping, terrestrial *herb*. *Tubers* not seen. *Leaf* linear to linear-lanceolate, (5–)10–22 cm long, 2.5–10 mm wide, erect, fleshy, canaliculate, ribbed abaxially, dark green with a purplish base, sheathing at base, apex acute to shortly acuminate.

Inflorescence (7–)15–25(–35) cm tall, 1–2.5 mm diam., straight, usually purplish, sometimes green. *Sterile bract* usually 1, occasionally 2, linear to linear-lanceolate, 2–5.5 cm long, 3.5–6 mm wide, green and purplish or entirely purple, closely sheathing, apex acuminate. *Fertile bracts* ovate-acuminate to obovate-acuminate, 4–20 mm long, 3–7 mm wide, closely sheathing the pedicels, usually purplish, occasionally the proximal margins of lowest bract connate. *Pedicels* 0–10 mm long, slender. *Ovary* narrow-obovoid, 5–14 mm long, 2–4 mm wide. *Flowers* 1–8, 13–21 mm diameter, usually pale blue or pale purplish blue, rarely pink or white, opening tardily on warm to hot days. *Perianth segments* 5–11 mm long, 3–6 mm wide, concave, often shortly apiculate; *dorsal sepal* ovate-lanceolate to ovate, acute to subacute, slightly larger than other segments; *lateral sepals* lanceolate to ovate-lanceolate, slightly asymmetric, acute; *petals* ovate to ovate-lanceolate, obtuse to subacute; *labellum* lanceolate to ovate-lanceolate, acute, slightly smaller than other segments. *Column* erect from the end of ovary, 4–6 mm long, 2–3 mm wide, pale pink to pale purplish; *post-anther lobe* hooding the anther, 2–3 mm long, 1.5–2 mm wide, tubular, slightly inflated, open on the ventral side, gently curved, dark brown to black, apex thickened, almost entire to shallowly v-notched, yellow; *post-anther lobe extension* 0.4–0.6 mm; *auxiliary lobes* absent, or sometimes present as 2 tiny incurved spurs on the lower apical margin of the post-anther lobe; *lateral lobes* converging, 0.8–1 mm long, digitiform, porrect at base, curved sharply upwards near the middle at c. 90°, each with a toothbrush-like arrangement of white trichomes along virtually their entire length, the individual trichomes 0.6–1 mm long, embracing the apex of the post-anther lobe. *Anther* inserted about mid-way along column, ovoid, 2–2.6 mm long, 1.3–2 mm wide, connective produced into an apical beak 0.5–0.9 mm long; *pollinarium* 1.3–2 mm long; *viscidium* more or less circular, c. 0.5 mm diam.; *pollinia* friable, mealy, white. *Stigma* situated at base of column, ovate-quadrate, 1.5–2.5 mm long, 1.5–2 mm wide, margins irregular. *Capsules* obovoid, 10–15 mm long, 4–6 mm wide, erect, ribbed. (Fig. 1 d–f; Plate 1. Fig. 10).

Selected specimens examined: South Australia: Flinders Range district: Alligator Gorge, top of the gorge on road to Battery Track, 30 ix. 1986, *M.A. Clements 4325* (CANB *8605470*); Spring Gully Conservation Park, 130 km N of Adelaide, 28 x. 2001, *R.J. Bates 60133* (MEL *2136725*). Victoria: 10.5 km NW of Rokewood on the Skipton Road, 17 x. 2001, *J.A. Jeanes 1169* (MEL *2114717*, MEL *2114719* & CANB); Gisborne, 25 x. 1935, *?G. Lyell s.n.* (MEL *573910*); Glenelg Shire, 4.75 miles W of Dergholm Post Office, 23 xi. 1971, *A.C. Beauglehole 37935* (MEL *652629* & MEL *2039748*); 14 km ENE of Mortlake, 18 x. 1991, *A.D. Bishop J175/27-29* (NSW *429778*); Beside Chatsworth Rd, c. 5 km W of Derrinallum, 15 x. 1991, *J.A. Jeanes 559* (MEL *2136716*); Township of Cressy on land adjacent to Hamilton Highway, 8 x. 1999, *J.A. Jeanes 572, C. & M. Trigg* (MEL *2136708*). Tasmania: Black Bull Scrub, c. 8.2 km S of Marrawah, 2 xi. 1998, *D.L. Jones 16065* (CANB *605698*); Mt Cameron, 19 xi. 1983, *A. Moscal 4218* (HO *110129*); Knocklofty, xi. 1840, *R.C. Gunn s.n.* (HO *00320737*); 11.2 km S of Arthur River, towards Temma, 4 xi. 1998, *D.L. Jones 16150* (CANB *605792*); King Island: Rocky cliffs N of Barrier Creek near top of ridge, 28 x. 1998, *D.L. Jones 15955 & M. Garratt* (CANB *605588*); Couta Rocks, scrub and rocky hills E of shacks, 3 xi. 1998, *D.L. Jones 16126* (CANB *605768*); Sisters Beach, near store, 31 x. 1998, *D.L. Jones 16020 & M. Garratt* (CANB *605653*); Flinders Island, Big River Rd, 16 x. 2000, *H. Wapstra JAJ881 & A. Wapstra* (MEL *2136710*).

Distribution and habitat: South Australia, Victoria and Tasmania (Fig. 11). Grows in basaltic grasslands, grassy woodlands, heathy woodland, heathland and dense shrubland, generally on heavy brown or black loam soils or occasionally on grey sandy loam. Altitude: 50–300 m.

Conservation status: Widespread, moderately abundant and well conserved.

Flowering period: September to November.

Pollination biology: This species is facultatively autogamous and sometimes also cleistogamous.

Notes: *Thelymitra exigua* is a cryptic species that has been overlooked in the past. There are a number of features that can be used in combination to define this species and distinguish it from all related taxa. Plants often grow in tight clumps, apparently from vegetative reproduction. The leaf is relatively broad and fleshy and is often nearly as tall as the inflorescence. The inflorescence is short and stout, rarely more than 25 cm tall, and usually has a solitary sterile bract. The lowest fertile bract sometimes (but not always) has the lower margins fused so that its base completely surrounds the rachis and pedicel. There are generally from one to four flowers (but sometimes as many as eight) that are autogamous (sometimes also cleistogamous) and will open tardily only on very warm to hot days. The perianth segments are up to 11 mm long, pale blue or pale purple, less often pink or white in colour. The post-anther lobe is slightly inflated and usually shallowly bilobed at the apex. The lateral lobes are up to 1 mm long and bend sharply upwards (at c. 90°) near their middle. The trichomes are up to 1 mm long and are in a toothbrush-like arrangement along virtually the entire length of the lateral lobes.

Thelymitra exigua is probably most closely related to *Thelymitra basaltica* Jeanes with which it sometimes grows. Both species share a clumping habit, but the latter generally flowers a little earlier, is a stockier plant, has larger ovaries and a longer, fleshier, more brittle leaf. The two species are readily distinguishable *in situ*, but less so in the preserved state as specimens are often incomplete or poorly pressed.

Thelymitra pauciflora is a taller, more slender, solitary species with a relatively shorter, narrower leaf and mop-like tufts of trichomes on the lateral lobes of the column.

Thelymitra exigua sometimes grows with *Thelymitra gregaria* D.L.Jones & M.A.Clem. and apparent hybrids between the two are common at these sites.

Etymology: Latin *exigua*, small, short: an allusion to the short, stout nature of the plants.

3. *Thelymitra brevifolia* Jeanes, *sp. nov.*

T. pauciflorae R.Br. affinis sed plantis robustioribus generatim, folio latiore et breviore proportione, inflorescentia plerumque floridiore, lobo post-antheram profunde irregulariter dissecto in duos lobos parallelos plus minusve, crocco-vivido saepe differt.

Type: Victoria. St Andrews, Dodd Street Reserve, 28 x. 2000, *J.A. Jeanes 896, S.A. Jeanes & C.M. Beardsell* (holotype MEL; isotypes MEL, CANB).

Thelymitra pauciflora R.Br. var. *pallida Nicholls, Orchidol. Zeylanica* 2: 159 (1935), *nom. inval. Type:* near Bell in the Blue Mountains, x. 1929, x. 1930 & x. 1933, *E. Nubling s.n.* (syntype MEL!) *syn. nov.*

Illustrations: Bates & Weber (1990) fig. 222 (as *T. pauciflora*); Bates (1999) page 69 fig. 3 (as *Thelymitra* sp. aff. *pauciflora*); Jeanes & Backhouse (2001) page 170 figs A–C (lower) (as *T.* sp. aff. *pauciflora* 1).

Glabrous terrestrial *herb*. *Tubers* ovoid, 1–2 cm long, 5–10 mm wide, fleshy. *Leaf* linear-lanceolate to lanceolate, (5–)10–26 cm long, (3–)7–20 mm wide, erect, thin-textured or leathery, more or less flat, ribbed abaxially, scabrous, dark green, often suffused with reddish purple, margins and mid-vein often purplish, base purplish, sheathing at base, apex acute to shortly acuminate. *Inflorescence* (12–)25–60 cm tall, 1–3.5 mm diam., straight, green to purplish. *Sterile bracts* usually 2, rarely 1 or 3, linear to linear-lanceolate, 2–9 cm long, 3.5–10 mm wide, closely sheathing, green or purplish, apex acute to acuminate. *Fertile bracts* ovate-acuminate to obovate-acuminate, 4–22 mm long, 3–7 mm wide, closely sheathing the pedicels, green or purplish. *Pedicels* 1–16 mm long, stout or slender. *Ovary* narrow-obovoid, 5–12 mm long, 2–4 mm wide. *Flowers* 2–10(–20), 12–22 mm diameter, usually purplish blue to purplish, rarely pink or white, opening only on warm to hot days. *Perianth segments* 6–10(–12) mm long, 3–6 mm wide,

concave, often shortly apiculate; *dorsal sepal* ovate-lanceolate to ovate, subacute; *lateral sepals* lanceolate to ovate-lanceolate, slightly asymmetric, acute; *petals* ovate, subacute; *labellum* lanceolate to ovate-lanceolate, acute, slightly smaller than other segments. *Column* erect from the end of ovary, 4–5.5 mm long, 2–3 mm wide, pale blue or pale pink; *post-anther lobe* hooding the anther, 2.5–3 mm long, 1.5–2.2 mm wide, tubular, not inflated, open on the ventral side, gently curved, dark brown, bright reddish orange, yellow or rarely black, apex thickened, almost entire, emarginate or deeply and irregularly slit producing 2 more or less parallel lobes, inner margin of lobes often erose, a small spur or bump often present at base of slit; *post-anther lobe extension* 0.4–0.8 mm; *auxiliary lobes* often present as 2 tiny bumps on the lower apical margin of the post-anther lobe; *lateral lobes* converging, 0.7–1 mm long, digitiform, porrect at base, curving gently upwards, each with a small, sub-terminal, mop-like tuft of white trichomes embracing the apex of the post-anther lobe, the individual trichomes 0.6–1 mm long. *Anther* inserted about midway along column, ovoid, 1.8–2.6 mm long, 1.2–2 mm wide, connective produced into an apical beak 0.3–0.6 mm long; *pollinarium* 1.2–2.2 mm long; *viscidium* more or less circular, c. 0.5 mm diam.; *pollinia* friable, mealy, white. *Stigma* situated at base of column, ovate-quadrate, c. 2 mm long, c. 2 mm wide, margins irregular. *Capsules* obovoid, 10–15 mm long, 4–7 mm wide, erect, ribbed. (Fig. 1 g–i; Plate 1. Fig. 12)

Selected specimens examined: South Australia: Southern Lofty Region: Scott Creek Conservation Park, 11 x. 1998, *R.J. Bates 51253* (CANB *612490*); Mt Bold, 28 x. 1994, *R.J. Bates 39546* (CANB *612492*); Southern Lofty Region: Cleland Conservation Park, 24 x. 1983, *R.J. Bates 25* (MEL *683700*); Mt Bold Rd, 28 x. 1994, *R.J. Bates 39547* (AD *RJB39547*); Southern Flinders Region: Alligator Gorge, 30 x. 1988, *R.J. Bates 15899* (AD *98848211*); Normanville, 16 x. 1967, *T. Smith 855* (AD *TS855*); Northern Lofty Region: Hughes Park, woodland S of Clove, x. 2000, *R.J. Bates 57675* (MEL *2100150*); Southern Lofty Region: Adelaide Gully Rd, Millbrook, 21 x. 2000, *R.J. Bates 57620* (MEL *2100142*). New South Wales: Southwest Slopes: Albury, 17 x. 1998, *P.G. Branwhite ORG2138* (CANB *611770*); Tinderry Mountains, 8.4 miles from Michelago towards Little Tinderry Homestead, 18 xii. 1972, *E.N. Canning 3422A* (CANB *51946*); Boyd River Trail, c. 3.5 km from Kanangra Walls Rd, 17 xi. 1991, *A.D. Bishop 180/0-3* (NSW *430010*); Newnes State Forest, Bungleboori picnic area, across road from cleared, grassy area, 24 i. 1996, *P.H. Weston 1951 & D.C. Godden* (NSW *394737*); Southern Tablelands. Top of the Great Dividing Range on road between Bungendore and Braidwood, 3 xi. 1996, *M.A. Clements 9121* (CANB *611776*); c. 9 km E of Captains Flat, at junction of Rocky Pic Forest Rd and Braidwood–Captains Flat Rd., 29 xi. 2000, *D.L. Jones 17734* (MEL *2136733* & CANB). Australian Capital Territory: Black Mountain, 16 x. 1998, *M.A. Clements 9754* (CANB *613157*); Brindabella Ranges, c. 4.6 km along Bendora Dam Road from Bulls Head, 24 xi. 1991, *D.L. Jones 8566 & B.E. Jones* (CANB *9803957*); Brindabella Ranges, corner of Warks Rd and Bendora Dam Road, 24 xi. 1991, *D.L. Jones 8560 & B.E. Jones* (CANB *9803951*). Victoria: 4 km S of St Arnaud P.O., 26 x. 1979, *A.C. Beauglehole 65614* (MEL *1530884*); Cardinia Reservoir, Bush adjoining E side of Aura Vale Lake, just S of Aura Vale Rd, 20 x. 1977, *T.B. Muir 5605* (MEL *1509600* & MEL *2039532*); Mt Eliza, between Baleome Creek and Emil Madsen Reserve, 30 x. 2000, *S.H. Lewis 755* (MEL *2089308*); Casterton–Penola Rd, c. 15 km W of Casterton, 2 xi. 1991, *T.J. Entwisle 2118* (MEL *2018774* & MEL *2018773*); Warrandyte State Park, Warrandyte, 'Fourth Hill' section, 6 xi. 1992, *D.J. Van Bockel 187* (MEL *2016932* & MEL *2046966*); Grampians area, Private Property adjoining Wartook State Forest and close to McKenzie River, 2 xi. 1988, *M.G. Corrick 10429* (MEL *1559753* & MEL *2039528*); Mt Richmond, West Spring Track, N end, 1 xi. 1991, *T.J. Entwisle 2098* (MEL *2018753*); Northern Plains region: Mount Pilot, 6 xi. 1998, *P.G. Branwhite ORG2121* (CANB *612469*); Beside Stony Point Railway line c 300 m NW of Stony Point Station, 15 x. 1999, *J.A. Jeanes 588* (MEL *2136707*). Tasmania: Near Gladstone, 1 xi. 1987, *R.J. Bates 11892* (BRI *652282*); Turnoff to Primrose Sands, north side of Arthur Highway, 20 xi. 1992, *J.E. Wapstra DLJ10924 & A. Wapstra* (CANB *611783*); Somerset, hills behind town in the private property of Albert Rettke, 6 xi. 1984, *M.A. Clements 3575d* (CANB *611793*); Quarry Hill between Boat Harbour and Sisters Beach, 3 xi. 1990, *D.L. Jones 6932 & C.H. Broers* (CANB *9016402*); Tam O'Shanter road turnoff Lulworth road, 8 xi. 1990, *D.L. Jones 7118 & C.H. Broers* (CANB *9614215*); 8.7 km S of Arthur River Bridge, towards Temma, 4 xi. 1998, *D.L. Jones 16131* (CANB *605773*); North Bruny Island, Dennes Point Rd, 5 xi. 2001, *J.A. Jeanes 1203, L. Rubenach, H. & A. Wapstra* (MEL *2136717*).

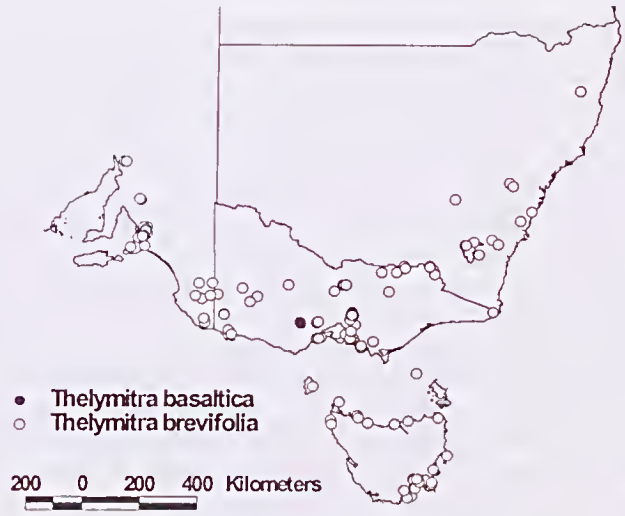

Figure 14. Distribution of *Thelymitra basaltica* and *Thelymitra brevifolia*.

Distribution and habitat: South Australia, New South Wales, Australian Capital Territory, Victoria and Tasmania (Fig. 14). Grows in a wide variety of habitats including open forest, woodland, heathland and heathy woodland, often in disturbed sites, sometimes on dry north or west facing slopes in skeletal soils or more usually in winter-wet areas on sand and clay loams. Altitude: 5–1000 m.

Conservation status: Very widespread and well conserved.

Flowering period: Late September to November.

Pollination biology: This species is facultatively autogamous.

Notes: *Thelymitra brevifolia* is a widespread species that has been confused with *T. pauciflora*. It can be distinguished from all other members of the *T. pauciflora* complex by a combination of characters. The leaf is relatively short, usually less than half the height of the inflorescence, and often as little as a quarter the height of the inflorescence. It is also usually rather broad and flat, ribbed on the back and suffused with purplish markings, often most obvious on the margins and base. There are usually 3 to 10 flowers (but sometimes as many as 20) that open tardily and are autogamous. The perianth segments are usually up to 10 mm long, often prominently apiculate, purplish in colour, rarely blue, pink or white. The post-anther lobe is not inflated and its apex has a rather rectangular appearance when viewed from the side and is bilobed to varying degrees ranging from shallowly emarginate to deeply and irregularly slit producing two more or less parallel lobes. It is often a distinctive reddish-orange to reddish-brown in colour. The lateral lobes are up to 1 mm long and project forward and upward in a gentle curve. The trichomes on the lateral lobes are white, usually up to 1 mm long and are arranged in small, neat, dense, sub-terminal bundles that embrace the tip of the post-anther lobe.

Thelymitra pauciflora has a relatively longer, narrower leaf, fewer flowers and an entire to emarginate post-anther lobe on the column.

This is apparently the taxon that Nicholls (1935) invalidly described (no Latin diagnosis) as *T. pauciflora* R.Br. var. *pallida* Nicholls. The type for this taxon is an unusual yellowish white flowered variant from near Bell in the Blue Mountains. Because the epithet 'pallida' is hardly appropriate for the taxon as a whole, I have chosen a new name for it at species rank.

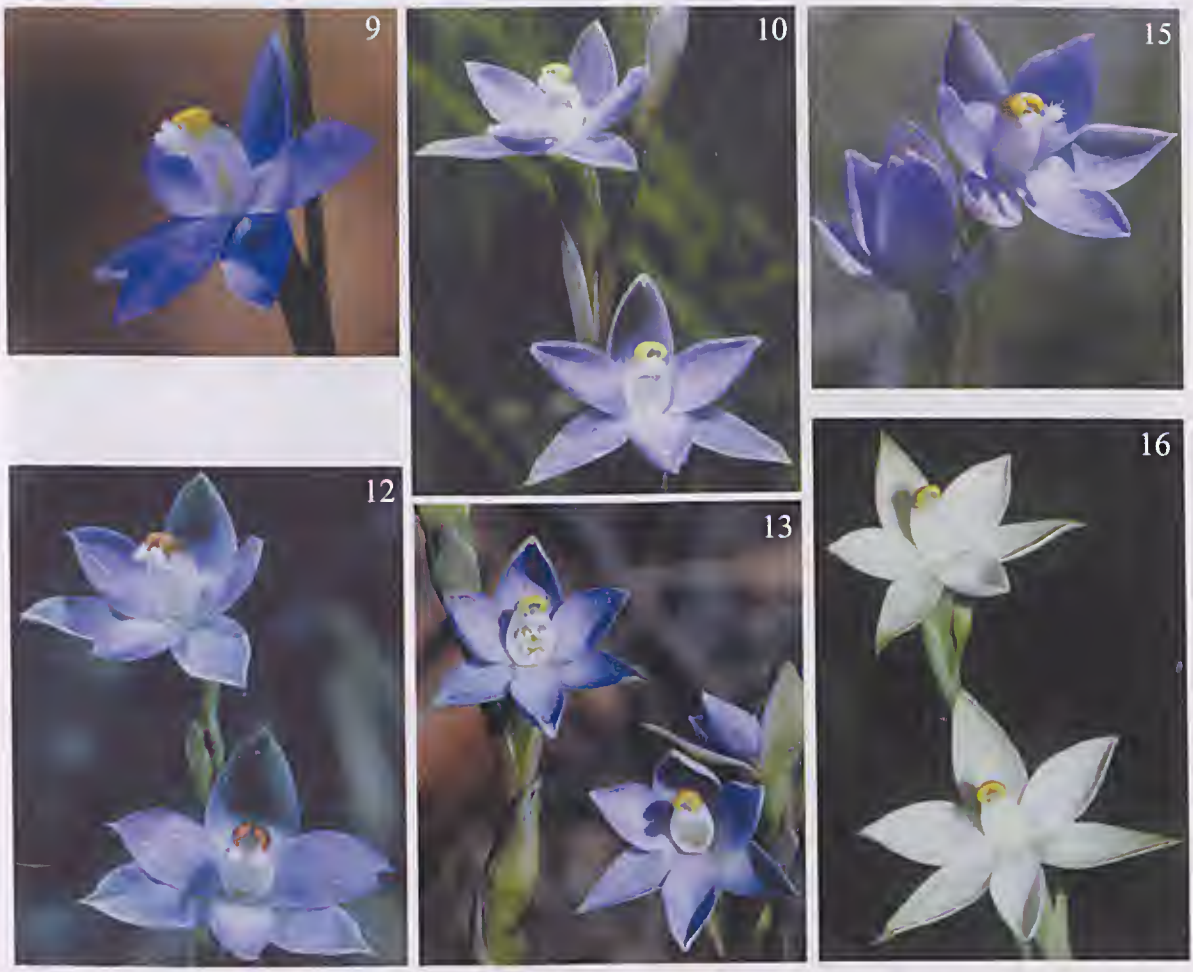

Plate 1. Figure 9. *Thelymitra pauciflora* Sydney area, New South Wales (photograph by T.J.Entwisle); **Figure 10.** *Thelymitra exigua* Woorndoo area, Victoria (photograph by J.A.Jeanes); **Figure 12.** *Thelymitra brevifolia* Christmas Hills area, Victoria (photograph by J.A.Jeanes); **Figure 13.** *Thelymitra basaltica* Rokewood, Victoria (photograph by J.A.Jeanes); **Figure 15.** *Thelymitra viridis* Blackmans Bay area, Tasmania (photograph by L.Rubenach); **Figure 16.** *Thelymitra albiflora* Adelaide Hills, South Australia (photograph by M.Houston).

Plate 2. Figure 18. *Thelymitra cyanapicata* Adelaide Hills, South Australia (photograph by R.J.Bates); **Figure 19**. *Thelymitra bracteata* Adelaide Hills, South Australia (photograph by R.J.Bates); **Figure 21**. *Thelymitra pallidiflora* Anglesea area, Victoria (photograph by J.A.Jeanes); **Figure 22**. *Thelymitra atronitida* Mallacoota area, Victoria (photograph by J.A.Jeanes); **Figure 24**. *Thelymitra malvina* Mallacoota area, Victoria (photograph by J.A.Jeanes); **Figure 25**. *Thelymitra peniculata* Crib Point area, Victoria (photograph by J.A.Jeanes)

Thelymitra brevifolia often grows sympatrically with other members of the *T. pauciflora* complex and apparent hybrids are sometimes observed.

The vernacular 'Peppertop Sun-orchid' has been associated with this species for many years, particularly in South Australia.

Etymology: Greek *brevis*, short; *folium*, leaf; the leaf is proportionately very short compared to the height of the inflorescence.

4. *Thelymitra basaltica* Jeanes *sp. nov.*

T. pauciflorae R.Br. affinis sed plantis brevioribus crassioribus caespitiformantibus generatim, folio latiori succulentiori inflorescentiam aequanti, bractea sterili solitaria ad apicem scapo divergentem et inflorescentia floribundiore generatim differt.

Type: Victoria, 10.5 km W of Rokewood towards Skipton, 8 x. 1998, *D.L. Jones 15818 & M. Garratt* (holotype CANB; isotypes MEL, CANB).

Glabrous, clumping, terrestrial *herb*. *Tubers* ovoid, 1–2.5 cm long, 5–15 mm wide, fleshy. *Leaf* linear to linear-lanceolate, 12–30 cm long, 5–15 mm wide, erect, very fleshy, canaliculate, ribbed abaxially, dark green with a purplish base, sheathing at base, apex acute to acuminate. *Inflorescence* 10–30 cm tall, 1.5–3.3 mm diam., straight, usually shorter than leaf, most often purplish, sometimes green. *Sterile bract* usually 1, rarely 2, linear to linear-lanceolate, 2.5–6 cm long, 5–9 mm wide, green and purplish or entirely purple, closely sheathing in lower part, apex often diverging from scape, acuminate. *Fertile bracts* ovate-acuminate to obovate-acuminate, 4–23 mm long, 3–8 mm wide, closely sheathing the pedicels, usually purplish, occasionally the proximal margins of lowest bract connate. *Pedicels* 0–7 mm long, moderately stout. *Ovary* narrow-obovoid, 2–10 mm long, 1.5–4 mm wide. *Flowers* 2–8, 15–22 mm diameter, usually pale blue or pale purplish blue, opening tardily on warm to hot days. *Perianth segments* 6–11 mm long, 3–7 mm wide, concave, often shortly apiculate; *dorsal sepal* ovate-lanceolate to ovate, obtuse to subacute, slightly larger than other segments; *lateral sepals* lanceolate to ovate-lanceolate, slightly asymmetric, acute; *petals* ovate to ovate-lanceolate, obtuse to subacute; *labellum* lanceolate to ovate-lanceolate, acute, slightly smaller than other segments. *Column* erect from the end of ovary, 4–6.5 mm long, 2.5–3.5 mm wide, pale blue; *post-anther lobe* hooding the anther, 2.5–3.5 mm long, 1.5–2.5 mm wide, tubular, somewhat inflated, open on the ventral side, gently curved, dark purplish to reddish brown, apex thickened, almost entire to shallowly bilobed, yellow; *post-anther lobe extension* 0.3–1.1 mm; *auxiliary lobes* absent or sometimes present as 2 tiny incurved spurs on the lower apical margin of the post-anther lobe; *lateral lobes* converging, 0.8–1.3 mm long, digitiform, porrect at base, curved sharply upwards near the middle at c. 90°, each with a toothbrush-like arrangement of white trichomes virtually along their entire length, the individual trichomes 0.5–1 mm long, embracing the apex of the post-anther lobe. *Anther* inserted about mid-way along column, ovoid, 2.3–2.8 mm long, 1.3–2 mm wide, connective produced into an apical beak 0.5–0.7 mm long; *pollinarium* 1.6–2.3 mm long; *viscidium* more or less circular, c. 0.5 mm diam.; *pollinia* friable, mealy, white. *Stigma* situated at base of column, ovate-quadrate, 2–2.5 mm long, 2–2.5 mm wide, margins irregular. *Capsules* obovoid, 10–15 mm long, 4–8 mm wide, erect, ribbed. (Fig. 2 a–c; Plate 1. Fig. 13)

Specimens examined: Victoria: 12.8 km W of Rokewood towards Skipton, 8 x. 1998, *D.L. Jones 15820 & M. Garratt* (CANB *617385*); Volcanic Plain: 11.6 km W of Rokewood beside the Skipton road, 11 x. 2002, *J.A. Jeanes 1228* (MEL *2172999*); 3.5 km W of Rokewood on the road to Skipton, 11 x. 2002, *J.A. Jeanes 1226* (MEL *2172950* & MEL *2172951*).

Distribution and habitat: Apparently endemic to Victoria where currently known with certainty only from the Rokewood area in the Victorian Volcanic Plain Natural Region (Conn 1993) (Fig. 14). Grows in remnant basaltic grasslands on sandy, brown volcanic loam soils. Altitude: 180–220 m.

Conservation status: Known only from a few roadside remnants and probably critically endangered. Suggest 2E by criteria of Briggs & Leigh (1996).

Flowering period: Late September and October.

Pollination biology: This species is facultatively autogamous and sometimes also cleistogamous.

Notes: *Thelymitra basaltica* is a cryptic species that has been overlooked in the past. There are a number of features that can be used in combination to define this species and distinguish it from all related taxa. Plants often grow in tight clumps, apparently from vegetative reproduction. The leaf is relatively broad, very fleshy, rather brittle and easily broken when bent and is usually as tall as the inflorescence and often exceeds it. The inflorescence is short and stout, rarely more than 20 cm tall, and usually has a solitary sterile bract whose tip diverges somewhat from the scape. The lowest fertile bract sometimes (but not always) has the lower margins fused so that its base completely surrounds the rachis and pedicel. There are generally one to six flowers (but sometimes as many as eight) arranged in a dense inflorescence. The flowers are autogamous (sometimes also cleistogamous) and will open only on very warm to hot days. The perianth segments are up to 11 mm long, pale blue or pale purple. The post-anther lobe is slightly inflated and the apex is almost entire to shallowly bilobed. The lateral lobes are up to 1 mm long and bend upwards sharply (at c. 90°) near their middle. The trichomes are up to 1 mm long and are arranged in toothbrush-like fashion along virtually the entire length of the lateral lobes.

Thelymitra basaltica is probably most closely related to *T. exigua* with which it usually grows in the field, but can be distinguished by its generally earlier flowering time, its broader, fleshier, more brittle leaf that equals or exceeds the inflorescence and the sterile bract whose tip diverges more from the scape.

Thelymitra pauciflora is a taller, more slender, solitary species with a relatively shorter, narrower leaf and mop-like tufts of trichomes on the lateral lobes of the column.

Most herbarium collections of *T. basaltica* are difficult to identify with any confidence as they do not usually reflect its clumping habit and are often incomplete or poorly preserved.

Etymology: An allusion to the apparent preference of the species for rich brown soils derived from basalt rock.

5. *Thelymitra viridis* Jeanes *sp. nov.*

Thelymitra pauciflorae R.Br. affinis sed plantis erassioribus generatim, pallidiore ubique, folio latiore, inflorescentia floribundiore generatim et columna grandiore, lobo post-antheram inflatiore differt.

Type: Tasmania. Wet Cave Beach, near eastern end of Rocky Cape National Park, 12 xi. 2001, *J.A. Jeanes 1214, H. & A. Wapstra & R. Hay* (holotype HO; isotypes MEL, CANB).

Illustration: Jones *et. al.* (1999) page 260 (as *T. arenaria*).

Glabrous, solitary or clumping, terrestrial *herb*. *Tubers* not seen. *Leaf* linear to linear-lanceolate, 10–25 cm long, 5–12 mm wide, erect, fleshy, canaliculate, ribbed abaxially, often mid-green throughout or sometimes with a purplish base, sheathing at base, apex acuminate. *Inflorescence* 15–30 cm tall, 1–2(–4) mm diam., straight, pale green. *Sterile bracts* usually 2, sometimes 1, linear to linear-lanceolate, 2–7.5 cm long, 4–8 mm wide, closely sheathing, pale green, acuminate. *Fertile bracts* ovate-acuminate to obovate-acuminate, 5–20(–25) mm long, 3–8 mm wide, sheathing the pedicels, pale green. *Pedicels* 0–10(–15) mm long, stout too slender. *Ovary* narrow-obovoid, 5–10 mm long, 1.5–4 mm wide. *Flowers* 2–7, 13–22 mm diameter, pale green outside, usually pale blue to pale purplish inside, opening tardily even on the hottest days. *Perianth segments* 5–11 mm long,

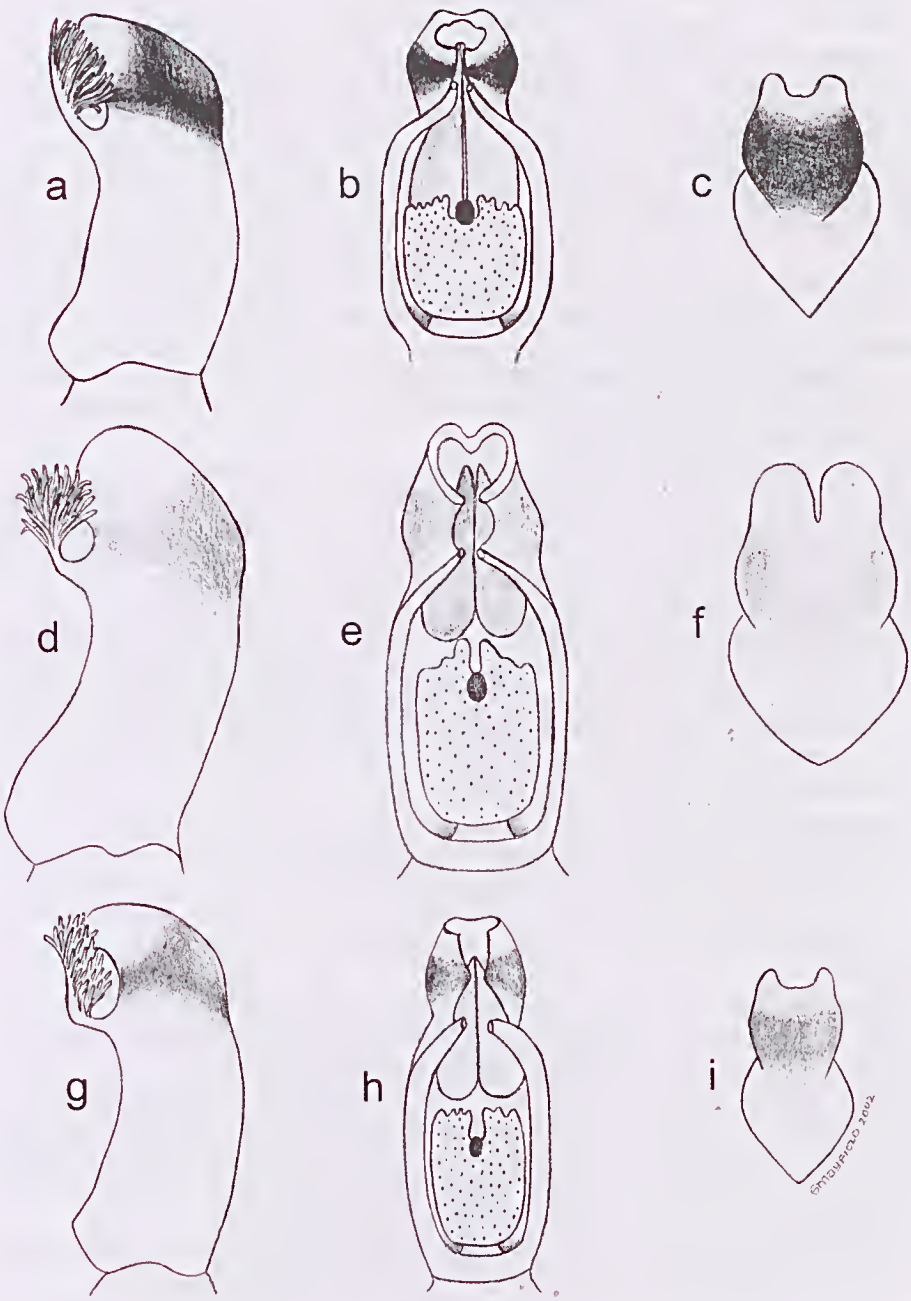

Figure 2.
Thelymitra basaltica: **a** column from side X 10; **b** column from front X 10; **c** post-anther lobe from rear X 10
Thelymitra viridis: **d** column from side X 10; **e** column from front X 10; **f** post-anther lobe from rear X 10
Thelymitra albiflora: **g** column from side X 10; **h** column from front X 10; **i** post-anther lobe from rear X 10

3.5–7 mm wide, concave, often shortly apiculate; *dorsal sepal* ovate, obtuse to subacute; *lateral sepals* ovate-lanceolate, acute; *petals* ovate, obtuse to subacute; *labellum* ovate-lanceolate, acute, only slightly smaller than other segments. *Column* erect from the end of ovary, 4.5–6 mm long, 2.2–3.7 mm wide, white; *post-anther lobe* hooding the anther, 2–3 mm long, 1.5–2.7 mm wide, tubular, widely open on ventral side, gently curved, mostly yellowish or sometimes brownish with a thin purplish collar, apex shallowly v-notched, yellow, distal margin not thickened; *post-anther lobe extension* 0.5–0.7 mm; *auxiliary lobes* often present as 2 tiny incurved spurs on the lower apical margin of the post-anther lobe; *lateral lobes* converging, 1–1.5 mm long, digitiform, porrect at base, curving gently upwards, each with a mop-like arrangement of white trichomes along the distal half, the individual trichomes 0.8–1.2 mm long. *Anther* inserted near centre of column, ovoid, 2–2.5 mm long, 1.5–2.2 mm wide, the connective produced into an apical beak 0.3–0.5 mm long; *pollinarium* 1.8–2.2 mm long; *viscidium* more or less circular, c. 0.5 mm diam.; *pollinia* mealy, friable, white. *Stigma* situated at base of column, ovate-quadrate, 1.5–2.5 mm long, 1.7–2.5 mm wide, margins irregular. *Capsules* obovoid, 8–18 mm long, 4–6 mm wide, erect, ribbed. (Fig. 2 d–f; Plate 1. Fig. 15)

Selected specimens examined: TASMANIA: Bridport, 31 x. 1987, *R.J. Bates 11409* (AD *98746496*); Blackmans Bay, Gate Track, 31 x. 1993, *J.E. Wapstra DLJ12540* (CANB *9614900*); Peters Swamp, Ford Road, Squeaking Point, 18 xi. 1998, *J.E. Wapstra ORG1831, A. Wapstra & P. Tonelli* (CANB *609365*); Three Hummock Island, edge of Telecom Airstrip, 7 xi. 1999, *P. Tonelli ORG2832* (CANB *610399*); Rebecca Ck, Arthur River Protected Area, 13 xi. 2001, *J.A. Jeanes 1218, R. Hay, H. & A. Wapstra* (MEL *2136749*, MEL *2136750*, HO & CANB); Maranoa Heights, Kingston, 2 xi. 2001, *J.A. Jeanes 1189, L. Rubenach, H. & A. Wapstra* (MEL *2136719*); Opposite Lake Llewellyn, Table Cape, 19 xi. 2000, *R. Hay JAJ774* (MEL *2136721*); Burwood Drive, Blackmans Bay adjacent to Peter Murrell Reserve, 2 xi. 2001, *J.A. Jeanes 1186, L. Rubenach, H. & A. Wapstra* (MEL *2136715* & HO).

Distribution and habitat: Apparently endemic to Tasmania where widespread (Fig. 17), but uncommon. Grows in near-coastal low heathland on seasonally wet sandy loam or around swamp margins. Altitude: 0–100 m.

Conservation status: Widespread and conserved, but poorly known and rarely collected. Suggest 3KC by criteria of Briggs & Leigh (1996).

Flowering period: Late October to late November.

Pollination biology: This species is facultatively autogamous and often also cleistogamous.

Notes: *Thelymitra viridis* is a cryptic species that has been confused with other members of the *T. pauciflora* complex. In the fresh state the overall pale green colour of the scape, bracts and the exterior of the sepals immediately distinguish it. The leaf is a slightly darker shade of green and often completely lacks any purplish colouration at the base. In the preserved state specimens are difficult to identify with confidence. It is most easily confused with *Thelymitra peniculata* Jeanes, but is a generally more stocky plant with a proportionately longer leaf, paler blue to purplish flowers, a paler column that is not as deeply notched at the apex and has generally shorter lateral lobes.

Thelymitra pauciflora is a more slender species with an overall darker, green appearance, a relatively shorter, narrower leaf, and generally fewer flowers.

Etymology: From the Latin *viridis*, green; the plants have an overall pale greenish appearance.

6. *Thelymitra albiflora* Jeanes *sp. nov.*

T. pauciflorae R.Br. affinis sed plantis robustioribus generatim, bracteae sterili solitaria, inflorescentia floribus usque ad decimum composita, floribus albis generatim, columna lobo post-antheram inflatiore leviter, lobis lateralibus per totam longitudem fere trichomatibus instructis differt.

Type: South Australia. Spring Gully Conservation Park near Clare, 24 x. 2001, *D.L. Jones 18012 & B.E. Jones* (holotype AD; isotypes MEL, CANB).

Illustration: Bates & Weber (1990) Plate 221 (as *T. pauciflora*).

Glabrous, terrestrial *herb. Tubers* ovoid, 1–2 cm long, 5–10 mm wide, fleshy. *Leaf* linear to linear-lanceolate, 10–30 cm long, 3–11 mm wide, erect, fleshy, canaliculate, ribbed abaxially, green with a purplish base, sheathing at base, apex acute to shortly acuminate. *Inflorescence* 15–50 cm tall, 0.8–3 mm diam., straight, usually pale green. *Sterile bract* usually 1, rarely 2, linear to linear-lanceolate, 2–6(–10) cm long, 3–8 mm wide, closely sheathing, usually pale green, apex acuminate. *Fertile bracts* ovate-acuminate to obovate-acuminate, 5–25(–40) mm long, 3–8 mm wide, closely sheathing the pedicels, usually pale green. *Pedicels* 1–13(–22) mm long, slender. *Ovary* narrow-obovoid, 4–14 mm long, 2–4 mm wide. *Flowers* 1–6(–10), 15–20 mm diameter, usually white, opening tardily on warm to hot days. *Perianth segments* 6–10 mm long, 3–6 mm wide, concave, often shortly apiculate; *dorsal sepal* ovate-lanceolate to ovate, obtuse to subacute, slightly larger than other segments; *lateral sepals* lanceolate to ovate-lanceolate, slightly asymmetric, acute; *petals* ovate to ovate-lanceolate, obtuse to subacute; *labellum* lanceolate to ovate-lanceolate, acute, slightly smaller than other segments. *Column* erect from the end of ovary, 4–5.5 mm long, 2–2.5 mm wide, white or pale blue; *post-anther lobe* hooding the anther, 2–3 mm long, 1.2–1.7 mm wide, tubular, slightly inflated, open on the ventral side, gently curved, reddish brown with a thin purplish collar, apex thickened, almost entire to emarginate, yellow; *post-anther lobe extension* 0.5–1.1 mm; *auxiliary lobes* absent or rarely present as 2 tiny incurved spurs on the lower apical margin of the post-anther lobe; *lateral lobes* converging, 0.8–1.5 mm long, digitiform, porrect at base, curved sharply upwards near the middle at c. 90°, each with a toothbrush-like arrangement of white trichomes along their entire length, the individual trichomes 0.5–0.8 mm long, embracing the apex of the post-anther lobe. *Anther* inserted about mid-way along column, ovoid, 2.2–2.7 mm long, 1.3–1.8 mm wide, connective produced into an apical beak 0.5–0.7 mm long; *pollinarium* 1.5–2.1 mm long; *viscidium* more or less circular, c. 0.4 mm diam.; *pollinia* friable, mealy, white. *Stigma* situated at base of column, ovate-quadrate, 1.7–2.5 mm long, 1.5–2 mm wide, margins irregular. *Capsules* obovoid, 12–18 mm long, 4–6.5 mm wide, erect, ribbed. (Fig. 2 g–i; Plate 1. Fig. 16)

Selected specimens examined: South Australia: Mount Lofty Range, Upper Waterfall Gully, c. 11 km ESE of Adelaide G.P.O., 14 x. 1966, *Hj. Eichler 18794* (AD *96650441*); Fleurieu Peninsula, At Blanchford Scrub, which is 11 km along Range Road to Waitpinga, 3 x. 1970, *D. Hunt 3294* (AD *97042059*); Southern Lofty Region: Cleland Conservation Park, 24 x. 1983, *P. Hornsby 21* (AD *98538258*); Southern Lofty: Myponga Conservation Park, 14 x. 1986, *D.E. Murfet 225* (AD *98650397*); Mt Lofty Range, Stonyfell, 8 x. 1973, *K. Preiss 263* (AD *97351303*); Southeast District: Hundred of Monbulla, 8 x. 1962, *D. Hunt 1204* (AD *96405384*); Southern Lofty Region: Mylor township, 30 x. 2001, *R.J. Bates 60156* (MEL *2136747* & MEL *2136748*); Southeast Region: Scott Creek Conservation Park, 11 x. 1998, *R.J. Bates 51252* (CANB *609397*); Mt Lofty Range: Mt Lofty Botanic Garden, SE section, 9 xi. 1966, *J.Z. Weber 273* (AD *96648183*).

Distribution and habitat: Apparently endemic to South Australia where distributed widely throughout the higher rainfall areas from near the coast to the ranges (Fig. 17). Grows in woodland, open forest, scrubland and heathland on well-drained gravely loam soils. Altitude: 0–500 m.

Conservation status: Widespread and conserved.

Flowering period: Late September to early November.

Pollination biology: This species is facultatively autogamous and often also cleistogamous.

Notes: *Thelymitra albiflora* is a slender species with up to 10 flowers that are usually white in colour. The post-anther lobe is slightly inflated, reddish brown with a yellow,

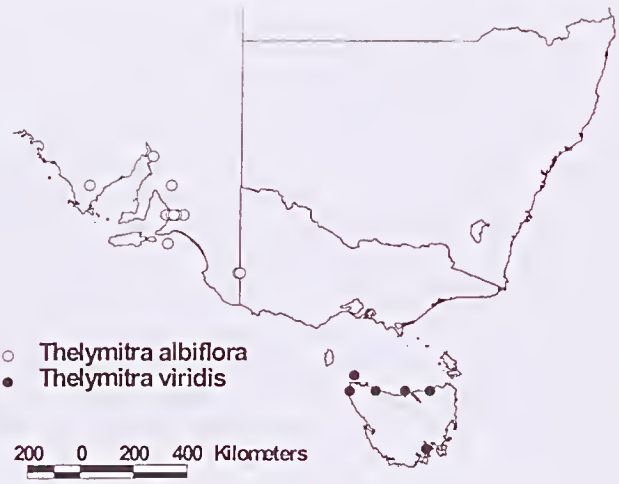

Figure 17. Distribution of *Thelymitra albiflora* and *Thelymitra viridis*.

entire to emarginate apex. The trichomes on the lateral lobes are arranged in long toothbrush-like tufts.

Thelymitra pauciflora generally has up to three flowers that are most often pale blue in colour, a less inflated post-anther lobe on the column and mop-like tufts of trichomes on the lateral lobes of the column.

Possible hybrids with *Thelymitra antennifera* (Lindl.) Hook.f. have been observed; the resulting progeny having pale yellow flowers and the basic column morphology of *Thelymitra* ×*macmillanii* F.Muell. (R.J. Bates pers. comm.).

Etymology: From the Latin *alba*, white, pale; *floris*, flower; the flowers of this species are usually white.

7. *Thelymitra cyanapicata* Jeanes *sp. nov.*

Thelymitra pauciflorae R.Br. affinis sed bractea sterili solitaria, lobo post-antheram caeruleo purpurascenti, lobis lateralibus uterque faseiculo subgloso pilis brevis faseiculatis albis glandiferis eomposito differt.

Type: South Australia. Southern Lofty Region: Kuitpo, 23 x. 1988, *R.J. Bates 15755* (holotype AD; isotypes AD).

Illustration: Bates (1999) fig. 4 (as *Thelymitra* sp. aff. *pauciflora* "Blue Column").

Glabrous, terrestrial *herb*. *Tubers* ovoid, 0.8–1.2 cm long, 4–6 mm wide, fleshy. *Leaf* linear, 12–22 cm long, 3–6 mm wide, erect, fleshy, canaliculate, green with a purplish base, sheathing at base, apex acuminate. *Inflorescence* 15–30 cm tall, 1–1.5 mm diam., straight, usually pale purplish to maroon. *Sterile bract* 1, linear to linear-lanceolate, 2–3 cm long, 3–5 mm wide, closely sheathing, green and purplish, apex acuminate. *Fertile bracts* ovate-acuminate to obovate-acuminate, 5–14 mm long, 3–5 mm wide, closely sheathing the pedicels, usually purplish. *Pedicels* 1–10 mm long, slender. *Ovary* narrow-obovoid, 6–12 mm long, 2–3.5 mm wide. *Flowers* 1–3, 12–18 mm diameter, blue, opening tardily on warm to hot days. *Perianth segments* 5–9 mm long, 2.5–5 mm wide, concave, often shortly apiculate; *dorsal sepal* ovate-lanceolate to ovate, obtuse to subacute, slightly larger than other segments; *lateral sepals* lanceolate to ovate-lanceolate, slightly asymmetric, acute; *petals* ovate to ovate-lanceolate, obtuse to subacute; *labellum*

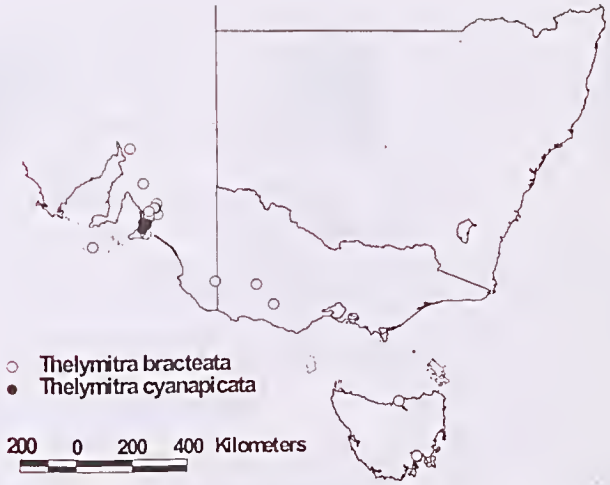

Figure 20. Distribution of *Thelymitra bracteata* and *Thelymitra cyanapicata*.

lanceolate to ovate-lanceolate, acute, slightly smaller than other segments. *Column* erect from the end of ovary, 4–5 mm long, 2–2.5 mm wide, same colour as perianth; *post-anther lobe* hooding the anther, 1.5–2 mm long, 1.2–1.6 mm wide, tubular, slightly inflated, open on the ventral side, gently curved, entirely dark blue, apex thickened, emarginate to shallowly v-notched; *post-anther lobe extension* 0.4–0.6 mm; *auxiliary lobes* present as 2 tiny spurs on the lower apical margin of the post-anther lobe; *lateral lobes* converging, 0.7–0.9 mm long, digitiform, porrect at base, curved sharply upwards near the middle at c. 90°, each with a dense toothbrush-like arrangement of white trichomes along their entire length, the tufts subglobose, the individual trichomes 0.4–0.6 mm long, gland-tipped. *Anther* inserted about mid-way along column, ovoid, 2.3–2.7 mm long, 1.3–1.7 mm wide, connective produced into an apical beak 0.5–0.7 mm long; *pollinarium* 1.6–2.2 mm long; *viscidium* more or less circular, c. 0.4 mm diam.; *pollinia* friable, mealy, white. *Stigma* situated at base of column, ovate-quadrate, 1.2–1.5 mm long, 1.3–1.7 mm wide, margins irregular. *Capsules* not seen. (Fig. 3 a–c; Plate 2. Fig. 18)

Specimens examined: South Australia: Southern Lofty Region: Knott Hill, Kuitpo Forest, 25 x. 1991, *R.L. Taplin 567 & D.E. Murfet* (AD *99145052*).

Distribution and habitat: Apparently endemic to South Australia where known only from the Kuitpo, Peter Creek and Glenshera areas of the Southern Lofty Region (Fig. 20). Grows under *Leptospermum* scrub in *Eucalyptus viminalis* and *Eucalyptus obliqua* woodland, on sandy soil in flat swampy terrain. Altitude: 200–400 m.

Conservation status: Probably critically endangered and on the verge of extinction. Suggest 2E by criteria of Briggs & Leigh (1996).

Flowering period: October and early November.

Pollination biology: This species is facultatively autogamous.

Notes: *Thelymitra cyanapicata* can be distinguished by the distinctive dark purplish blue post-anther lobe. It is a small slender species with a narrow leaf and a single sterile bract. It has from one to three small, blue, tardily opening flowers. The lateral lobes are short, bend upward sharply at about the middle and each has a dense subglobose cluster of short, white, trichomes.

Thelymitra pauciflora is a taller, more slender species, usually with two sterile bracts and a post-anther lobe that is mostly brownish in colour with a yellow apex.

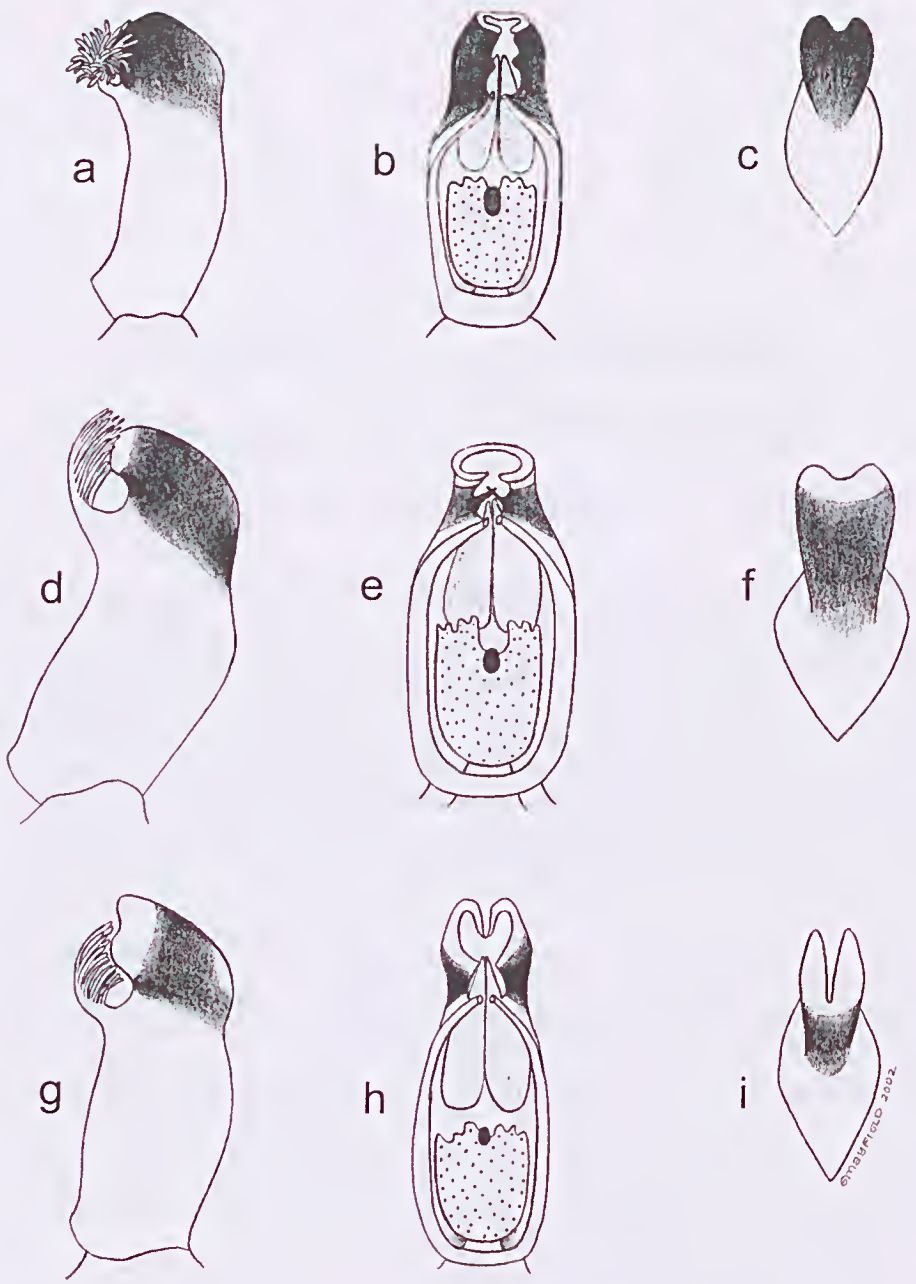

Figure 3.
Thelymitra cyanapicata: **a** column from side × 8; **b** column from front × 8; **c** post-anther lobe from rear × 8
Thelymitra bracteata: **d** column from side × 8; **e** column from front × 8; **f** post-anther lobe from rear × 8
Thelymitra pallidiflora: **g** column from side × 8; **h** column from front × 8; **i** post-anther lobe from rear × 8

Possible hybrids with *Thelymitra rubra* Fitzg. and *Thelymitra juncifolia* Lindl. have been observed (Bates 1999).

Etymology: From the Latin *cyan*, blue; *apica*, apex; the apex of the column (the post-anther lobe) is a distinctive dark purplish blue in colour, a feature unique for the genus.

8. *Thelymitra bracteata* J.Z.Weber ex Jeanes ***sp. nov.***

T. arenariae Lindl. affinis sed plantis robustioribus generatim, folio longiore et latiore, bracteis sterilibus et fertilis grandioribus, inflorescentia elatiore floribus pluribus composita, saepe pedicellis florum inferorum decurrentibus in rachidi parte differt.

Type: South Australia. Southern Lofty Region: Mackereth Cottage, Scott Creek Conservation Park, 11 xi. 1989, *R.J. Bates 21500* (holotype AD; isotypes BRI, PERTH, HO).

Illustration: Bates (1999) page 70 fig. 5 (as *Thelymitra* sp. aff. *pauciflora*).

Glabrous terrestrial *herb*. *Tubers* not seen. *Leaf* linear-lanceolate, 20–45 cm long, 8–15 mm wide, erect, leathery, ribbed abaxially, dark green with a purplish base, sheathing at base, blade more or less flat, apex often somewhat lax, acute to acuminate. *Inflorescence* 30–70(–100) cm tall, 2–7 mm diam., rather stout, straight, straw-coloured to purplish. *Sterile bracts* usually 2, occasionally 1 or 3, linear to linear-lanceolate, 3–15 cm long, 3–15 mm wide, lower bract closely sheathing throughout, acute to acuminate, upper bract mostly free with base usually only half encircling the scape, acuminate, green to purplish. *Fertile bracts* lanceolate-acuminate to oblanceolate-acuminate, 4–35 mm long, 3–8 mm wide, sheathing the pedicels, green to purplish. *Pedicels* 2–25 mm long, slender, those of the lower flowers usually partially decurrent on rachis. *Ovary* narrow-obovoid, 5–15 mm long, 1–4 mm wide. *Flowers* 5–20(–30), 16–30 mm diameter, pale blue inside, sepals greenish outside, opening tardily on warm to hot days. *Perianth segments* 6–14(–17) mm long, 3–7 mm wide, thin-textured, concave, often shortly apiculate; *dorsal sepal* ovate, obtuse to subacute; *lateral sepals* lanceolate to ovate-lanceolate, often asymmetric, acute; *petals* ovate to ovate-lanceolate, obtuse to subacute; *labellum* lanceolate, acute, often slightly smaller than other segments. *Column* erect from the end of ovary, (4–)5–6.5 mm long, 2.5–3.5 mm wide, white or greenish; *post-anther lobe* hooding the anther, 2.5–3.5 mm long, 1.3–2 mm wide, tubular, not inflated, curving through c. 90°, reddish brown to brown, apex emarginate, yellow; *post-anther lobe extension* 0.5–1 mm; *auxiliary lobes* usually present as 2 tiny incurved spurs on the lower apical margin of the post-anther lobe; *lateral lobes* converging, 1.2–1.7 mm long, digitiform, porrect at base, bent sharply upwards at about the middle, each with a dense toothbrush-like arrangement of trichomes that embrace the apex of post-anther lobe, the individual trichomes 0.8–1.2 mm long, white. *Anther* inserted at about the centre of column, ovoid, 2–3 mm long, 1.5–2 mm wide, the connective produced into a forward-pointing apical beak 0.4–0.6 mm long; *polliuarium* 1.4–2.6 mm long; *viscidium* more or less circular, c. 0.5 mm diam.; *pollinia* mealy, friable, white. *Stigma* situated at base of column, ovate-quadrate, 2–2.5 mm long, 1.8–2.2 mm wide, margins irregular. *Capsules* obovoid, 15–25 mm long, 4–8 mm wide, erect, ribbed. (Fig. 3 d–f; Plate 2. Fig. 19)

Selected specimens examined: South Australia: Murray Region: Mt Beever (Downers Scrub), 20 x. 1994, *R.J. Bates 39547* (AD *99448151*); Southern Lofty Region: Mylor, 20 x. 1983, *R.J. Bates 3489* (AD *98410144*); Southern Lofty Region: On hillside above dam off Carey Gully Rd, 13 xii. 1997, *R.J. Bates 49269* (AD *99928011*); Murray Region: Kaiser Stuhl Conservation Park, 24 xi. 1992, *R.J. Bates 29990* (AD *99321324*, NSW *468554* & MEL *287503*); Southern Lofty Region: Clarendon, Adelaide Hills, 28 x. 1994, *R.J. Bates 39545* (CANB *9612491*); Southern Lofty Region: Mt Crawford, xi. 2000, *R.J. Bates 57727* (MEL *2100139*); Southern Lofty Region: Woodland at Windebanks turnoff opposite Scott Creek Conservation Park, 28 x. 1988, *R.J. Bates 15812* (AD *98848230*); Southern Lofty Region: Spring Gully Conservation Park, 9 x. 1999, *R.J. Bates 54363* (AD *111897*); Southern Lofty Region: Norton Summit, x. 1999, *R.J. Bates 54399* (AD

111894); Southern Lofty Region: Warren Conservation Park, 10 xi. 1988, *R.J. Bates 16033* (AD *98848228*); Southern Lofty Region: Nortons Summit, 13 xii. 1907, *R.S. Rogers 4979* (AD *97725217*); Kangaroo Island Region: 12 miles from Karalla towards Playford Highway, 29 ix. 1965, *E.J. Caroll s.n.* (CANB *39883*). VICTORIA: Glenisla, Corner Henty Highway and Billywing Road, 29 x. 2000, *A. Tindall 31* (MEL *2121332*); c. 2 km from Woorndoo towards Chatsworth, 16 xi. 2000, *D.L. Jones 17692 & K.J. Fitzgerald* (CANB *631087*). TASMANIA: Georgetown, 31 x. 1987, *R.J. Bates 11560* (AD *98746519*, MEL *2116841*, AK & HO); Rosny Hill, Eastern Shore Hobart, 2 xi. 2001, *J.A. Jeanes 1185, L. Rubenach, H. & A. Wapstra* (MEL *2136396*, MEL *2136397* & HO).

Distribution and habitat: Known from South Australia, Victoria and Tasmania (Fig. 20). Reasonably widespread in South Australia where found in the Northern Lofty, Southern Lofty, Kangaroo Island, Murray and Southeast Regions; localised in Victoria, where known currently from two collections in the Grampians and the Victorian Volcanic Plain Natural Regions (Conn 1993) and localised in Tasmania in the vicinity of Georgetown and Hobart. Confined to grassland, woodland and open forest, often in disturbed areas such as forest clearings and tracks, usually in richer soils. Altitude: 5–600 m.

Conservation status: Of limited distribution and rare, but well conserved. Suggest 3RC by criteria of Briggs & Leigh (1996).

Flowering period: Late September to early December.

Pollination biology: This species is facultatively autogamous.

Notes: *Thelymitra bracteata* is the most robust member of the *T. panciflora* complex, sometimes standing nearly one metre tall (Bates 1999). The leaf is long, moderately broad, leathery, has a rather flat blade and is ribbed on the outer surface. The sterile and fertile bracts are also very large and, in those cases where there are multiple sterile bracts, the base of the uppermost one generally does not completely encircle the scape leaving the blade free. The pedicels are very long and slender and the lower ones are often partially decurrent on the rachis. The inflorescence can have up to 30 flowers that are pale blue to pale purplish inside and the sepals are green outside. The post-anther lobe is rather narrow, not inflated and shallowly notched at the apex. The lateral lobes are bent upwards sharply at the middle and have a toothbrush-like arrangement of white trichomes along much of their length.

Thelymitra bracteata has been confused with *T. arenaria*, but the latter is generally less robust, has a smaller, more channelled leaf, smaller bracts, fewer flowers and the pedicels are never decurrent on the rachis.

Etymology: Latin *bracteatus*, provided with bracts; both the sterile and fertile bracts are very prominent in this species.

9. *Thelymitra pallidiflora* Jeanes *sp. nov.*

T. arenariae Lindl. affinis sed bractea sterili solitaria, floribus albis vel cyaneis dilutis, lobo post-antheram columnae atro ad apicem luteum incisum profunde differt.

Type: Victoria, Anglesea: Near the intersection of Jarosite track and Ironbark Basin Track, 21 x. 2001, *J.A. Jeanes 1054* (holotype MEL; isotypes MEL, CANB)

Illustration: Jeanes & Backhouse (2001) p. 168 fig. C (as *T. nuda*).

Glabrous terrestrial *herb*. *Tubers* not seen. *Leaf* linear to linear-lanceolate, 10–25 cm long, 5–12 mm wide, erect, thin-textured to fleshy, canaliculate, pale to dark green, sometimes with a purplish base, ribbed abaxially, sheathing at base, apex acuminate. *Inflorescence* 15–45 cm tall, 1.3–3 mm diam., straight, straw-coloured to purplish. *Sterile bract* usually 1, rarely 2, linear to linear-lanceolate, 1.5–8.5(–18) cm long, 4–9 mm wide, green or purplish, acute to acuminate. *Fertile bracts* ovate-acuminate to obovate-

acuminate, 5–30 mm long, 3–8 mm wide, green or purplish, sheathing the pedicels. *Pedicels* 2–15 mm long, slender, those of the lower flowers sometimes partially decurrent on rachis. *Ovary* narrow-obovoid, 4–10 mm long, 1.5–3.5 mm wide. *Flowers* 2–10, 20–30 mm diameter, white to very pale blue, opening only in hot weather. *Perianth segments* 9–15(–21) mm long, 3–8 mm wide, concave, usually acute, often shortly apiculate; *dorsal sepal* ovate to elliptic; *lateral sepals* narrow-ovate to lanceolate, slightly asymmetric; *petals* ovate; *labellum* elliptic to lanceolate, often narrower than other segments; *column* erect from the end of ovary, 5–6.5 mm long, 2.5–3.2 mm wide, same colour as perianth; *post-anther lobe* hooding the anther, 2.5–3.5 mm long, 1.8–2.2 mm wide, tubular, inflated, gently curved through c. 90°, mostly black or very dark brown, apex bilobed, yellow, lobes 0.7–1.5 mm long; *post-anther lobe extension* 0.3–0.9 mm; *auxiliary lobes* absent; *lateral lobes* converging, 1–1.7 mm long, digitiform, porrect at base then curving upwards, each with a toothbrush-like arrangement of white trichomes along most of their length, the individual trichomes 0.6–1.2 mm long. *Anther* inserted c. mid-way along column, ovoid, 2.4–3 mm long, 1.5–2 mm wide, the connective produced into a beak 0.4–0.7 mm long; *pollinarium* 1.8–2.6 mm long; *viscidium* more or less circular, c. 0.5 mm diam.; *pollinia* friable, mealy, white. *Stigma* situated at base of column, ovate-quadrate, 1.7–2.2 mm long, 1.7–2.2 mm wide, margins irregular. *Capsules* obovoid, 10–15 mm long, 4–6 mm wide, erect, ribbed. (Fig. 3 g–i; Plate 2. Fig. 21)

Specimens examined: Victoria: Crib Point, near the intersection of Lorimer & Bay Rds, 31 x. 2000, *J.A. Jeanes 902* (MEL *2136722*); Anglesea, 19 xi. 1992, *J. Riley DLJ10741* (CANB *9702607*); Anglesea, 17 xi. 1992, *K. Morgan & M. McDonald s.n.* (MEL *2046973*); Anglesea area, x. 1992, *J.A. Jeanes 555* (MEL *2136726*); Corner of Forest Road and Gum Flat Road, c. 8 km N of Anglesea, x. 1993, *J.A. Jeanes 556* (MEL *2136729*).

Distribution and habitat: Apparently endemic to south-central Victoria where currently known only from the Anglesea and Crib Point areas in the Otway Plain and Gippsland Plain Natural Regions (Conn 1993) (Fig. 23). Grows in heathy and grassy woodland on sandy loams. Altitude: 5–100 m.

Conservation status: Probably endangered as it is known currently from only four sites with a total of less than 100 plants. Suggest 3EC by criteria of Briggs & Leigh (1996).

Flowering period: Late October and November.

Pollination biology: This species is facultatively autogamous

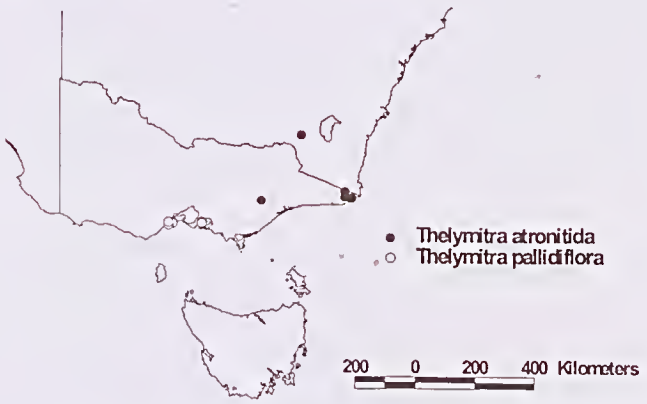

Figure 23. Distribution of *Thelymitra atronitida* and *Thelymitra pallidiflora*.

Notes: *Thelymitra pallidiflora* is a distinctive member of the *T. pauciflora* complex that is not likely to be confused with any other species, at least in the fresh state. It can be readily identified by its stocky habit, usually solitary sterile bract, white or very pale blue flowers that are up to 30 mm in diameter and the post-anther lobe that is inflated, usually black or very dark brown in colour with a deeply v-notched yellow apex. A high proportion of plants at the type locality have the lower pedicels partially decurrent on the rachis and the ovaries of many of the lower flowers misshapen.

Etymology: From the Latin *pallida*, pale; *floris*, flower; the flowers of this species are white or very pale blue.

10. *Thelymitra atronitida* Jeanes, *Muelleria* 14: 91 (2000).

Type: Victoria. Beside Genoa Creek Track, c. 4 km WSW of Genoa, 27 x. 1999, *J.A. Jeanes 613* (holotype MEL!; isotype CANB!).

Illustrations: Jeanes (2000) p. 92 fig. 1 a, b, c & d; p. 93 fig. 3; Jeanes (2001) p. 95 fig. 1 a, b, c & d; p. 96 fig. 3; Jeanes & Backhouse (2001) page 169.

Glabrous terrestrial *herb*. *Tubers* not seen. *Leaf* linear to linear-lanceolate, 15–35 cm long, 5–12 mm wide, erect, leathery, canaliculate, ribbed abaxially, dark green with a purplish base, sheathing at base, apex acute. *Inflorescence* 30–50 cm tall, 1.5–3.5 mm diam., straight, straw-coloured to purplish. *Sterile bracts* usually 2, occasionally 3, linear to linear-lanceolate, 1.5–7 cm long, 3–10 mm wide, green or purplish, acute to acuminate. *Fertile bracts* ovate-acuminate to obovate-acuminate, 5–25 mm long, 3–8 mm wide, green or purplish, sheathing the pedicels. *Pedicels* 5–12 mm long, slender. *Ovary* cylindrical to narrow-obovoid, 5–12 mm long, 2–4 mm wide. *Flowers* 2–8(–16), (14–)20–26 mm diameter, moderately dark blue with darker longitudinal veins, opening readily only on hot days. *Perianth segments* (7–)10–13 mm long, 3–8 mm wide, concave, often shortly apiculate; *dorsal sepal* ovate to elliptic, obtuse to subacute; *lateral sepals* elliptic to lanceolate, slightly asymmetric, acute; *petals* ovate to elliptic, obtuse to subacute; *labellum* elliptic to lanceolate, acute, often narrower than other segments; *column* erect from the end of ovary, 5.5–7 mm long, 2.5–3.5 mm wide, mostly pale blue; *post-anther lobe* hooding the anther, 3–4 mm long, 1.5–2.5 mm wide, tubular, inflated, dorsally compressed towards the apex, gently curved through c. 90°, mostly glossy black, apex shortly bilobed, yellow, lobes toothed, apical orifice small; *post-anther lobe extension* 1.1–1.7 mm; *auxiliary lobes* often present as 2 tiny incurved spurs on the lower apical margin of the post-anther lobe; *lateral lobes* converging, 1.3–1.5 mm long, digitiform, porrect at base then curved upwards at about the middle, each with a more or less terminal mop-like arrangement of white trichomes, the individual trichomes 1.2–1.6 mm long. *Anther* inserted towards apex of column, ovoid, 2.6–3.3 mm long, 1.2–2.2 mm wide, connective produced into an apical beak 0.5–0.8 mm long; *pollinarium* 2–2.5 mm long; *viscidium* more or less circular, c. 0.5 mm diam.; *pollinia* friable, mealy, white. *Stigma* situated at base of column, ovate-quadrate, 1.7–2.5 mm long, 1.8–2.2 mm wide, margins irregular. *Capsules* obovoid, 12–15 mm long, 4–6 mm wide, erect, ribbed. (Fig. 5 a–c; Plate 2, Fig. 22)

Specimens examined: New South Wales: End of Cape Solander Drive, Cape Solander, Captain Cook's Landing Place National Park, 8 viii. 1988, *P.H. Weston 1228 & A. Bishop* (NSW *417826*); Bago State Forest, 3 xii. 1999, *P.G. Branwhite 127* (CANB *609392*). Victoria: Between Jones Creek Track and Private Property, W of Genoa River, 7 xi. 1970, *A.C. Beauglehole 34425* (MEL *652511*); Near the intersection of East Wingan Rd and Princes Hwy, 24 x. 1999, *J.A. Jeanes 643* (MEL *2069956*); Beside East Wingan Rd c. 500 m from Princes Hwy, 27 x. 1999, *J.A. Jeanes 728* (MEL *2096169*); Valencia Creek Road, Esteppy Yars area, c. 12.5 miles SE of Mt Wellington, 1 xi. 1973, *A.C. Beauglehole 43458* (MEL *652737*); Genoa, 6 xi. 1992, *A.D. Bishop J239/1-3* (NSW *429780*); Mallacoota, Near intersection of Karbethong Rd and Genoa–Mallacoota Rd, 15 xi.

1991, *J.A. Jeanes s.n.* (MEL *2046943*).

Distribution and habitat: Mostly eastern Victoria with two disjunct localities in southeastern New South Wales (Cape Solander and Bago State Forest) (Fig. 23). In Victoria apparently confined to the East Gippsland and the Eastern Highlands Natural Regions (Conn 1993). Currently known from a few sites between Cann River and Mallacoota in far East Gippsland, with an outlying, more westerly population near Valencia Creek. Grows in heathy open forest, usually around the margins of grasstree plains, on well-drained sand or clay loams. Altitude: 5–200 m.

Conservation status: Poorly known; suggest 3KC by criteria of Briggs & Leigh (1996).

Flowering period: Mostly late October to early November in Victoria, but as early as August and as late as December in New South Wales.

Pollination biology: This species is facultatively autogamous.

Notes: *Thelymitra atronitida* closely resembles *T. peniculata*, but the post-anther lobe of the latter species is not strongly compressed dorsally towards the apex, has a much larger apical orifice and is less obviously glossy black in colour and the trichomes on the lateral lobes are in a much more terminal mop-like tuft. *Thelymitra atronitida* also resembles *Thelymitra malvina* M.A.Clem., D.L.Jones & Molloy, but the latter usually has three sterile bracts, more, generally larger flowers that are often entomophilous, a post-anther lobe that is mostly brownish and mauve or pink trichomes on the lateral lobes.

11. *Thelymitra malvina* M.A.Clem., D.L.Jones & Molloy, *Cat. Austral. Orchid.* (Austral. Orchid Res. 1) 141 (1989).

Type: Wannon Region: Just south of Wilkin, c. 21 km NNW of Dartmoor, 28 x. 1985, *G.W. Carr 10423* (holotype MEL!, isotypes AD!).

Thelymitra nuda sensu R.D. Fitzgerald, *Aust. orch.* 1(5): [t. 2] (1879), *non* R.Br. (1810).

Illustrations: Fitzgerald (1879) 1: 5 (as *T. nuda*); Nicholls (1969) Plate 31 (as *T. nuda*); Backhouse & Jeanes (1995) page 347; Jones *et al.* (1999) pages 261 & 279.

Glabrous terrestrial *herb*. *Tubers* ovoid, 1–3 cm long, 5–12 mm wide, fleshy. *Leaf* linear to linear-lanceolate, 10–35 cm long, 5–20 mm wide, erect, canaliculate, fleshy, light to dark green with a purplish base, ribbed abaxially, sheathing at base, apex acute. *Inflorescence* 25–75 cm tall, 1.5–5 mm diam., slender to moderately stout, straight, green to purplish. *Sterile bracts* usually 3, occasionally 2, linear to linear-lanceolate, 2–10 cm long, 4–11 mm wide, closely sheathing, acute to acuminate, green or purplish, upper bract usually free with base usually only half encircling the scape. *Fertile bracts* ovate-acuminate to obovate-acuminate, 8–30 mm long, 3–6 mm wide, sheathing the pedicels, green or purplish. *Pedicels* 5–15 mm long, slender. *Ovary* cylindrical to narrow-obovoid, 5–12 mm long, 2–4 mm wide. *Flowers* 3–25, 18–32 mm diameter, slate blue to mauve inside, sepals greenish outside, opening freely in warm weather. *Perianth segments* 8–16 mm long, 3–7 mm wide, concave, acute, often shortly apiculate; *dorsal sepal* elliptic to lanceolate; *lateral sepals* elliptic to lanceolate, slightly asymmetric; *petals* ovate to lanceolate; *labellum* elliptic to linear-lanceolate, often narrow than other segments. *Column* erect from the end of ovary, 6–7.5 mm long, 2.5–3.7 mm wide, white to blue or mauve; *post-anther lobe* hooding the anther, 2–4 mm long, 1.5–2.5 mm wide, tubular, inflated, compressed dorsally, curved gently, dark reddish brown, apex shallowly bilobed, lobes toothed, orifice small, yellow; *post-anther lobe extension* 0.6–2 mm; *auxiliary lobes* absent; *lateral lobes* converging, 1–1.5 mm long, digitiform, obliquely erect, each with a more or less terminal, dense, erect, mop-like arrangement of pink or mauve (rarely white) trichomes, the individual trichomes 1–1.5 mm long. *Anther* inserted near middle of column, ovoid, 2.5–3.5 mm long, 1.2–2.2 mm wide, the connective produced into a

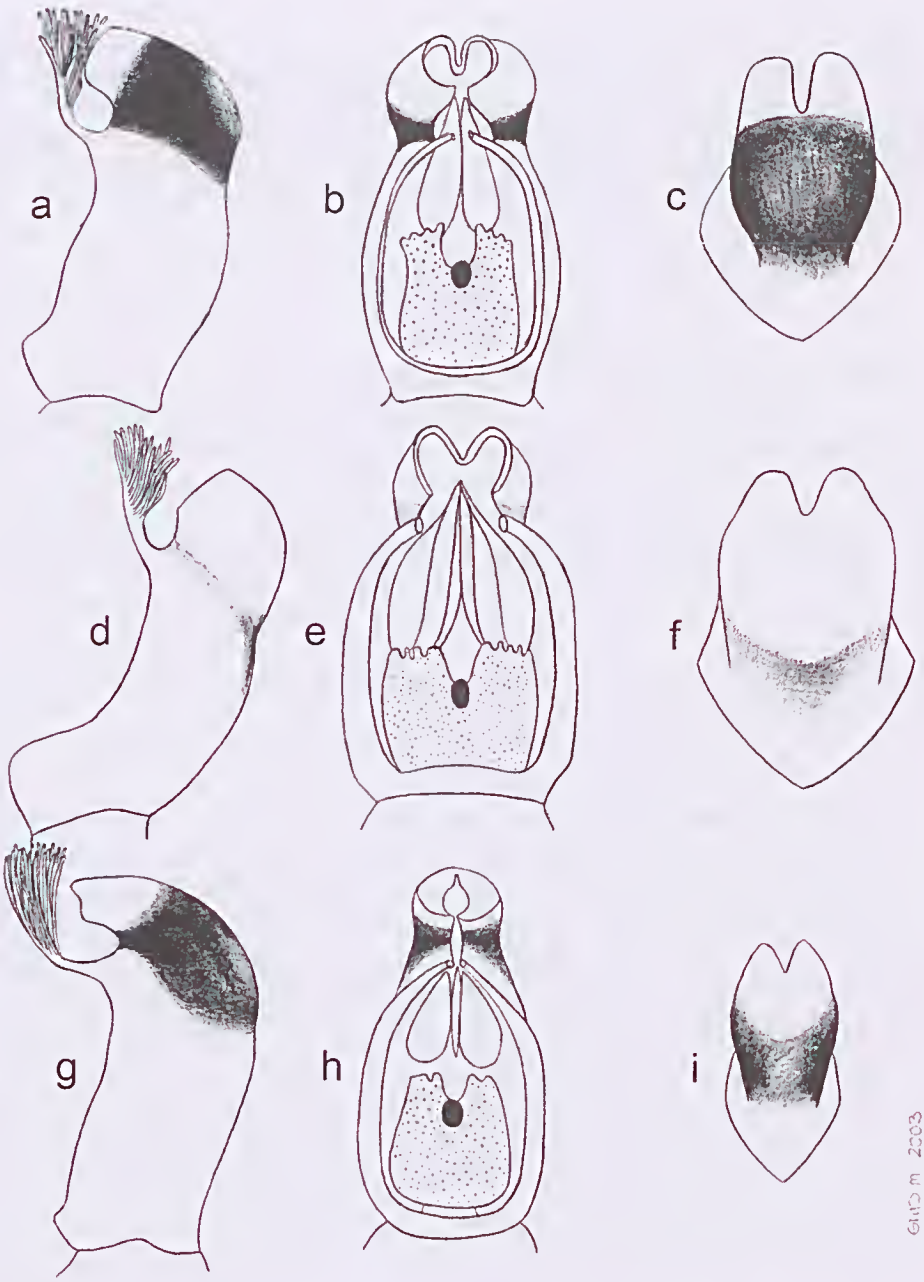

Figure 4.
Thelymitra batesii: **a** column from side x 10; **b** column from front x 10; **c** post-anther lobe from rear x 10
Thelymitra frenchii: **d** column from side x 10; **e** column from front x 10; **f** post-anther lobe from rear x 10
Thelymitra malvina: **g** column from side x 7; **h** column from front x 7; **i** post-anther lobe from rear x 7

beak 0.5–1 mm long; *pollinarium* 1.5–2.5 mm long; *viscidium* more or less circular, c. 0.5 mm diam.; *pollinia* mealy, friable or coherent, white. *Stigma* situated at base of column, ovate-quadrate, 1.8–2.6 mm long, 1.5–2.5 mm wide, margins irregular. *Capsules* obovoid, 12–20 mm long, 4–6 mm wide, erect, ribbed. (Fig. 4 g–i; Plate 2, Fig. 24)

Selected specimens examined: South Australia: Stony Point, c. 3 km S of Naracoorte Caves, 25 x. 1966, *M. Beek s.n.* (AD *98247005*); Southeast District: Honans Scrub Native Forest Reserve, 6 xi. 1989, *P. Penny s.n.* (AD *99237310*). Queensland: Moreton District: Jacobs Well, ix. 1997, *G. Leiper 6* (BRI *656098*); Wide Bay District: Fraser Island National Park, on side of Wanggoolba air strip, 9 ix. 1998, *R. Crane 2108* (CANB *612488*); Leichhardt District: Mt Moffatt National Park, Consuelo Tablelands, 6 x. 1998, *R. Crane 2241 & 2255* (CANB *612489* & CANB *612464*); Between Myora and Point Lookout, North Stradbroke Island, 30 viii. 1969, *R. Coveny 2035* (NSW *0303*). New South Wales: Burleigh Heads, x. 1945, *C.P. Ledward s.n.* (MEL *1532671*); Cape Solander, Kurnell, Botany Bay National Park, 23 ix. 1992, *A.D. Bishop J221/26-37* (NSW *429491*); Weston, Southern Maitland Coalfields, ix. 1930, *H.M.R. Rupp 865* (AD *7631485*); Tomago, Hunter River, ix. 1953, *R.W. Freney s.n.* (NSW *190474*); Belmont, ix. 1926, *Mrs. H.M.R. Rupp s.n.* (NSW *190468*); c. 4.8 km N of Evans Head on the Broadwater Road, 2 ix. 1973, *R. Coveny 5115* (NSW *1167*); South West Rocks, 29 km NE of Kempsey, 22 viii. 1973, *R. Coveny 4962* (NSW *1153*); Central Coast: Jamberoo Mt, 28 x. 1992, *R. Tunstall DLJ10499* (CANB *9702346*); North Coast: c. 3 km N of Lake Cathie, Lake Innes Reserve, 8 ix. 1990, *D.L. Jones 6449 & C.H. Broers* (CANB *9015914*). Victoria: About 2.5 km NW of Mallacoota by the Genoa to Mallacoota Road, 11 x. 1979, *J.G. Eichler s.n.* (MEL *105418*); East Gippsland, c. 5 miles direct SSW of Mallacoota P.O., 29 x. 1969, *A.C. Beauglehole 31352* (MEL *652671*); French Island, Pinnacles Rd, 1 km W of Clump Rd, 31 x. 1987, *C. Gordes 17* (MEL *1581014*); Near Dorodong, c. 10 miles WNW of Dergholm (on Glenelg River), far western Victoria, 28 x. 1962, *A.C. Alcock s.n.* (MEL *655234*); East Gippsland, Turn-off to Genoa Creek, 4.6 km W of Genoa on Princes Highway, 20 x. 1991, *A.B. Peisley 11* (MEL *2010780*); Providence Ponds Flora and Fauna Reserve, 22 x. 1984, *A.C. Beauglehole 78729* (MEL *670970*); East Gippsland, Cape Conran Rd between Marlo Plains Rd turn-off and Marlo–Cape Conran Rd., 12 xi. 1970, *A.C. Beauglehole 34508* (MEL *652508*); Gippsland Plain, Rosebud, vacant block on Old Cape Schanck Rd, c. 200 m SW from its junction with Jetty Rd, 17 x. 1993, *N.G. Walsh 3513* (MEL *2021667*). Tasmania: Banana Ridge, 20 km NNW of Lady Barron, Flinders Island, 26 x. 1990, *P. Collier 4867* (HO *127025*); Tasmans Arch, 18 xi. 1974, *P. Palmer s.n.* (HO *410818*); Hunter Island, xi. 1979, *P. Touelly s.n.* (HO *500821*); Rocky Cape National Park, hills south of Burgess Cove (Cathedral Hill), 30 x. 1998, *D.L. Jones*

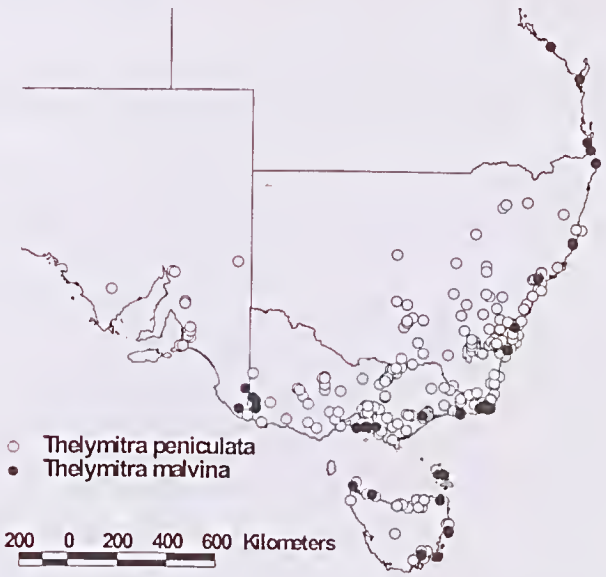

Figure 26. Distribution of *Thelymitra peniculata* and *Thelymitra malvina*.

15992 & M. Garratt (CANB *605625*): Coles Bay, around refuse tip, 11 xi. 1990, *D.L. Jones 7177 & C.H. Broers* (CANB *9016443*); Gladstone, 31 x. 1987, *R.J. Bates 11324* (AD *9874651*); Flinders Island: Reedy Lagoon Road, 2 km N near old scallop dump, 29 x. 1992, *C. Spry DLJ10557* (CANB *9702405*).

Distribution and habitat: South Australia, Queensland, New South Wales, Victoria, Tasmania and New Zealand (Fig. 26). Grows in tall open forest, heathy woodlands and coastal scrublands on well-drained sand and clay loams. Altitude: 10–200 m.

Conservation status: Widespread, sometimes locally common and reasonably well represented in reserves.

Flowering period: August to November.

Pollination biology: This species can apparently be either facultatively autogamous or entomophilous.

Notes: *Thelymitra malvina* is very variable in terms of flower size, with plants from some colonies having insect-pollinated flowers more than 30 mm in diameter, while plants from other colonies have self-pollinating flowers less than 20 mm in diameter. In spite of this variation in flower size, the species is well-defined, quite distinctive and easily identified in the field. Plants are generally tall and slender with a large fleshy leaf and usually three sterile bracts. The inflorescence can have up to 25 flowers that may be slate blue to mauve inside and have a greenish appearance on the outside. The post-anther lobe is very long, tubular, compressed dorsally, dark reddish brown in colour and has a very small apical orifice. The lateral lobes have large, terminal, mop-like tufts of pink or mauve (rarely white) trichomes. *Thelymitra malvina* is probably most closely related to *Thelymitra atronitida*, but the latter usually has only two sterile bracts, fewer, generally smaller flowers that are dark blue with darker longitudinal veins, a predominantly glossy black post-anther lobe and white trichomes on the lateral lobes.

12. ***Thelymitra peniculata*** Jeanes, *sp. nov.*

T. pauciflorae R.Br. affinis sed plantis robustioribus generatim, folio latioro, inflorescentia floribus pluribus generatim composita, lobo post-antheram columnae bilobo profunde saepe et lobis lateralibus ad apices trichomatibus longis albis in caespiti compositis differt.

Type: New South Wales. Southwest Slopes: Red Hill, c. 3 km N of Narrandera, 8 x. 1988. *D.L. Jones 2956 & M. Clements* (holotype CANB; isotypes CANB, MEL, AD, NSW).

Illustrations: Fitzgerald (1880) 1: 6 (as *T. longifolia*); Backhouse & Jeanes (1995) page 340 (as *T. holmesii*); Bates (1999) page 69 fig. 1 (right, as *Thelymitra* sp. aff. *holmesii*); Jeanes & Backhouse (2001) page 172 figs A–F. (as *Thelymitra* sp. aff. *holmesii* 2).

Glabrous terrestrial *herb*. *Tubers* ovoid, 1–3 cm long, 5–15 mm wide, fleshy. *Leaf* linear, 14–25(–44) cm long, 5–12(–20) mm wide, erect, canaliculate, fleshy, ribbed abaxially, dark green with a purplish base, sheathing at base, apex acute to acuminate. *Inflorescence* 20–50(–66) cm tall, 1–3.5 mm diam., slender to stout, straight, purplish. *Sterile bracts* usually 2, occasionally 1 or 3, linear to linear-lanceolate, 2–8(–12) cm long, 4–8(–11) mm wide, closely sheathing, acute to acuminate, green to purplish. *Fertile bracts* ovate-acuminate to obovate-acuminate, 5–27 mm long, 3–7 mm wide, sheathing the pedicels, green to purplish. *Pedicels* 0.5–15 mm long, slender. *Ovary* narrow-obovoid, 5–12 mm long, 2–3.5 mm wide. *Flowers* (1–)4–10(–18), 14–22 mm diameter, usually rich purple, opening tardily on warm to hot days. *Perianth segments* 6–10(–12) mm long, 3–6.5 mm wide, concave, often shortly apiculate; *dorsal sepal* ovate, obtuse to subacute; *lateral sepals* lanceolate to ovate, often asymmetric, acute; *petals* ovate to obovate,

obtuse to subacute; *labellum* obovate to oblanceolate, acute, often slightly smaller than other segments. *Column* erect from the end of ovary, (4.5–)5–6.5 mm long, 2.5–4 mm wide, pink or purplish; *post-anther lobe* hooding the anther, 3–4 mm long, 2–3 mm wide, tubular, often somewhat compressed dorsally, open or closed on the ventral side, curving abruptly through c. 90°, dark brown to almost black, apex usually deeply bilobed, yellow, the lobes (0.5–)1–1.5 mm long, margins thickened and recurved; *post-anther lobe extension* 0.5–1.1 mm; *auxiliary lobes* often present as 2 triangular, incurved spurs to 0.5 mm long, on the lower apical margin of the post-anther lobe, sometimes touching near tip of anther beak; *lateral lobes* converging or more or less parallel, 1.2–1.5 mm long, digitiform, porrect at base, curving gently upwards, each with a sub-terminal, mop-like, moderately sparse, untidy tuft of trichomes that embrace the apex of post-anther lobe, the individual trichomes (0.8–)1–1.3 mm long, white, sometimes proximal ones pinkish at base. *Anther* inserted above centre of column, ovoid, 2–3 mm long, 1.8–2.2 mm wide, the connective produced into an apical beak 0.4–0.8 mm long; *pollinarium* 1.5–2.3 mm long; *viscidium* more or less circular, c. 0.5 mm diam.; *pollinia* mealy, friable, white. *Stigma* situated at base of column, ovate-quadrate, 2–2.5 mm long, 2–2.5 mm wide, margins irregular. *Capsules* obovoid, 10–20 mm long, 4–8 mm wide, erect, ribbed. (Fig. 5 d–f; Plate 2. Fig. 25).

Selected specimens examined: South Australia: Southern Lofty Region: Myponga Conservation Park, 14 x. 1986, *D.E. Murfet 276* (AD *98702487*); Flinders Ranges Region: Alligator Gorge National Park, 27 ix. 1988, *R.J. Bates 15644* (AD *98844241*). New South Wales: Northwest Slopes: 2.5 km from entrance to Mt Kaputar National Park, hill on N side, 1 x. 1989, *D.L. Jones 5182* (CANB *8913714*); Near Bathurst, Wambool Nature Reserve, 1989, *S. Cardale s.n.* (NSW *433885*); Central Coast: Norah Head, 30 ix. 1997, *B. Branwhite ORG867* (CANB *609290* & CANB *609289*); Paterson, 14 ix. 1925, *H.M.R. Rupp s.n.* (MEL *625277* & MEL *625496*); Toronto, x. 1931, *A.N. Burns s.n.* (MEL *625360*); Southern Tablelands: Mount Jerrabomberra, lower western slopes, 14 x. 1985, *M.A. Clements 3872* (CANB *8504821*); Central-west Slopes: Kangarooby, 16 x. 1984, *M.A. Clements 3522* (CANB *8411210*); South Coast: Bella Vista Estate, South side of Snowy Mountains Hwy, 26 x. 1997, *D.L. Jones 15616 & B.E. Jones* (CANB *9908914*); Central-west Slopes: 20 km S of Dubbo on Newell Highway, 20 x. 1986, *R.G. Tunstall 158* (CANB *8605721*). Australian Capital Territory: Majura Field Firing Range, 20 x. 1999, *M. Garratt ORG2785, K.J. Fitzgerald & P.O. Downey* (CANB *613184*); Black Mountain, near summit road, SW of C.S.I.R.O., 22 x. 1963, *L.G. Adams 735* (CANB *152270* & NSW); Mt Ainslie, 29 x. 1991, *C.H. Broers 231 & D.L. Jones* (CANB *9109482*); Western slopes of Mt Taylor, 13 xi. 1991, *D.L. Jones 8508, B.E. Jones & S.R. Jones* (CANB *9803904*); c. 7 km S of Thawa on main road to Namadgi, 25 x. 1998, *M.A. Clements 9769* (CANB *611787*). Victoria: Mount Granya State Park, 31 x. 1987, *A.C. Beauglehole 90259 & A.D.J. Piesse* (MEL *238610*); Pine Mountain National Park, 19 x. 1987, *A.C. Beauglehole 88606 & L.W. Huebner* (MEL *238608*); Midlands: Deep Lead Flora Reserve, SE of Deep Lead, 14 x. 1991, *T.J. Entwisle 2046* (MEL *2018677*); East Gippsland: Reedy Creek on the Princes Highway 3 miles E of Cann River, 5 xi. 1969, *T.B. Muir 4760* (MEL *518810*); Wannon: Wootong Vale, c. 8 km NNE of Coleraine, 26 xi. 1993, *Y. Ingeme s.n.* (MEL *2018383*); Eildon Cemetery, 30 x. 1960, *T.B. Muir 1607* (MEL *221677*); c. 3 km from Boorhaman towards Peechelloa, 5 x. 2000, *D.L. Jones 17578 & B. Jones* (MEL *2087460*, MEL *2089299* & CANB *620830*); Brisbane Ranges National Park, near the intersection of Swamp Track and Lease Road, 18 xi. 2000, *J.A. Jeanes 966* (MEL *2087450* & MEL *2089310*); Royal Botanic Gardens, Cranbourne, edge of Arboretum Mallee area, 7 xi. 2000, *W. Worboys JAJ943* (MEL *2087454* & MEL *2089305*); Darlimurla area, c. 500 m W of the Darlimurla railway station beside old rail line, 8 xi. 2000, *J.A. Jeanes 934* (MEL *2087457* & MEL *2089302*). Tasmania: Flinders Island, Tanners Bay Tinfield, 27 x. 1967, *J.S. Whinray 64* (MEL *1532020*); Ford Road, Squeaking Point, 12 xi. 1998, *P. Tonelli ORG1796* (CANB *609308*); Myrtle Bank, 10 xii. 1995, *J. Campbell 95044* (CANB *611795*); Hollybank, 27 xi. 1994, *J. Campbell 94162* (CANB *612462*); Creekton Road, 1 xii. 1992, *J. Campbell 92375* (CANB *611796*); Seamander, 11 xi. 1995, *J. Campbell 95032* (CANB *611706*); Lulworth tip, 8 xi. 1990, *D.L. Jones 7100 & C.H. Broers* (MEL *250349*, HO 326130, CANB *9614197*); Peggs Beach, 4 xi. 1990, *D.L. Jones 6982 & C.H. Broers* (CANB *9614079*).

Distribution and habitat: South Australia, New South Wales, Australian Capital Territory, Victoria and Tasmania (Fig. 26). Grows in a wide range of habitats including dry grassy woodlands, open forests, wet and dry heathlands and grassland. Altitude: 5–1000 m.

Conservation status: Widespread, reasonably common and well conserved.

Flowering period: September to November.

Pollination biology: This species is facultatively autogamous.

Notes: *Thelymitra peniculata* is a moderately robust species with a long, fairly narrow leaf. The inflorescence usually has two to eight flowers that open tardily and have deep purplish perianth segments that are mostly 6–10 mm long. The column is usually considerably more than half the length of the perianth segments. The post-anther lobe is large and inflated and usually deeply bifid at the apex. The lateral lobes usually curve gently upwards and are terminated by a moderately sparse, semi-erect tuft of white trichomes that are about 1 mm long. At least the proximal one quarter to one half of the lateral lobes is glabrous.

Thelymitra peniculata has been confused with *T. holmesii*, but the two species are distinct. The latter usually grows in wetter habitats and flowers somewhat later, the post-anther lobe is usually more deeply bifid at the apex and the trichomes on the lateral lobes are usually longer, cream or yellow (seldom white as in *T. peniculata*) and are generally arranged in a more elongate, open, untidy tuft.

Plants of *T. peniculata* from more mesic sub-coastal areas flower later, are often more robust and often have more flowers. Plants from the northern end of the range often have three sterile bracts and a longer, more thin-textured leaf, thus approaching *T. angustifolia* in vegetative morphology. Interesting populations from South Australia (Alligator Gorge National Park and Spring Gully Conservation Park) and New South Wales (Cocoparra area) have few or no trichomes on the lateral lobes. These plants are best regarded as aberrant since occasionally flowers with perfectly formed penicillate lateral lobes will occur on the same inflorescence as flowers with glabrous or sparsely trichomic lateral lobes.

Etymology: Latin *peniculus*, brush, tuft like the tail of a horse; the trichomes are more or less confined to the upper half of the lateral lobes in a loose, semi-erect tuft resembling a horse's tail.

13. *Thelymitra angustifolia* R.Br., *Prodr.* 314 (1810).

Type: Tropical Australia: Port II (Port Clinton, Queensland), 22 ix. 1802, *R. Brown s.n.* (lectotype α BM!, fide Clements 1989; isolectotypes BM!, AD!).

Illustration: Dockrill (1992) page 173 (as *T. pauciflora*).

Glabrous terrestrial *herb*. *Tubers* not seen. *Leaf* linear, 15–50 cm long, 5–10 mm wide, erect, thin textured, canaliculate near base becoming flat distally, ribbed abaxially, dark green with a purplish base, sheathing at base, apex acute to acuminate. *Inflorescence* 20–60 cm tall, 1.5–3 mm diam., slender, straight, green or purplish. *Sterile bracts* usually 3, sometimes 2 or 4, linear to linear-lanceolate, 1.5–7.5 cm long, 2.5–9 mm wide, closely sheathing, acute to acuminate, green or purplish. *Fertile bracts* ovate-acuminate to obovate-acuminate, 5–16 mm long, 3–6 mm wide, green or purplish, acute to acuminate, sheathing pedicels. *Pedicels* 1–6 mm long, stout to slender. *Ovary* narrow-obovoid, 2.5–11 mm long, 1–4 mm wide. *Flowers* 2–10, 18–27 mm diameter, purplish blue, opening only on warm to hot days. *Perianth segments* 8–12(–15) mm long, 3–6 mm wide, often shortly apiculate; *dorsal sepal* ovate, obtuse to subacute; *lateral sepals* lanceolate to ovate, asymmetric, acute; *petals* ovate, obtuse to subacute; *labellum* elliptic to

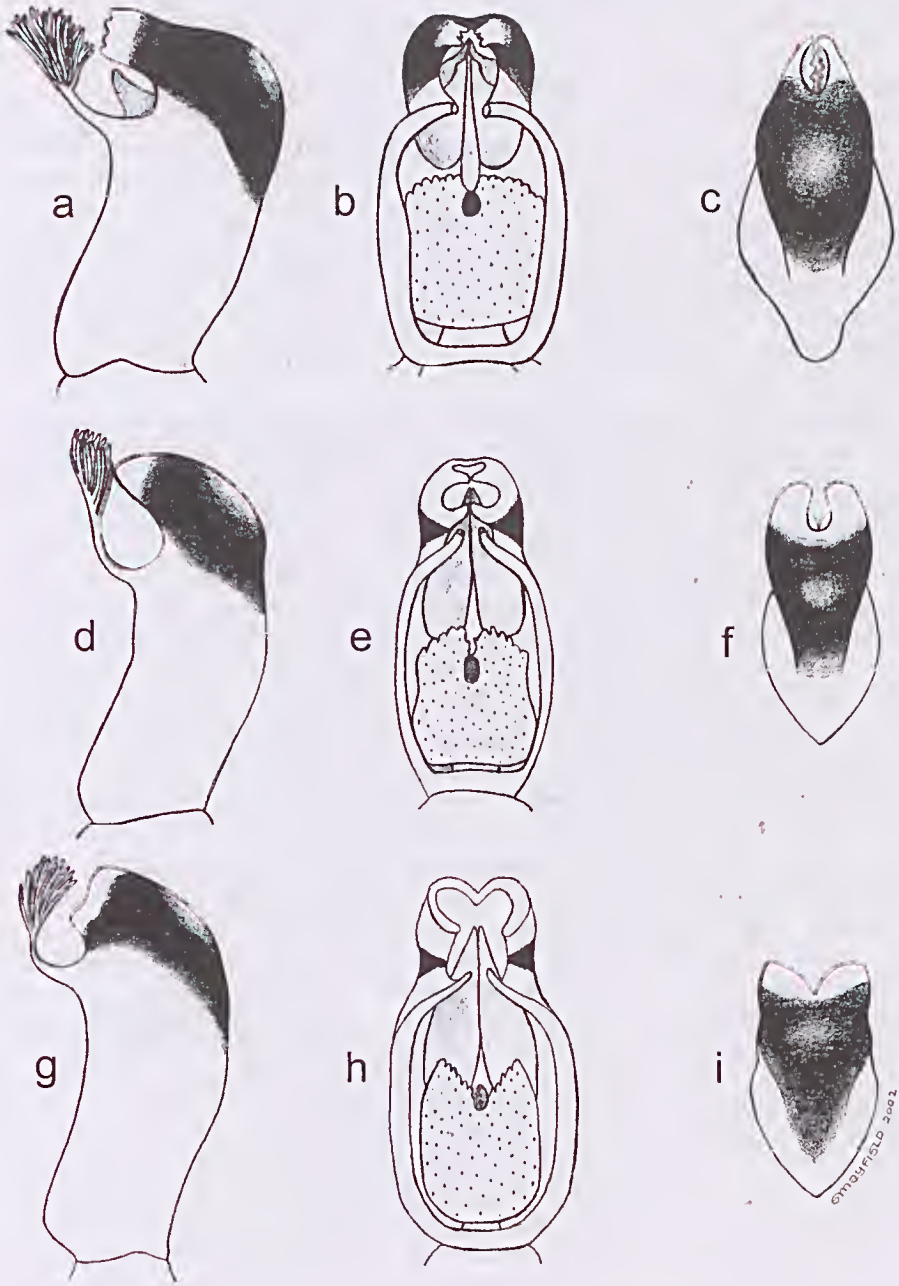

Figure 5.
Thelymitra atronitida: **a** column from side x 8; **b** column from front x 8; **c** post-anther lobe from rear x 8
Thelymitra penicillata: **d** column from side x 8; **e** column from front x 8; **f** post-anther lobe from rear x 8
Thelymitra angustifolia: **g** column from side x 8; **h** column from front x 8; **i** post-anther lobe from rear x 8

oblanceolate, acute, often narrower than other segments. *Column* erect from the end of ovary, 4.5–6 mm long, 2.2–3.2 mm wide, pale blue to pinkish; *post-anther lobe* hooding the anther, 3–4 mm long, 1.5–2.2 mm wide, tubular, gently curved, brownish, apex deeply bilobed, yellow, lobes with irregularly undulate margins; *post-anther lobe extension* 0.4–0.8 mm; *auxiliary lobes* absent or reduced to 2 tiny incurved spurs on distal margin of the post-anther lobe; *lateral lobes* converging, 1–1.5 mm long, digitiform, fleshy, porrect at base, curved gently upwards, distal half with an erect, mop-like arrangement of white trichomes, the individual trichomes 0.9–1.2 mm long. *Anther* inserted about mid-way along column, ovoid, 2.2–3 mm long, 1.4–2.1 mm wide, connective produced into an apical beak 0.6–0.8 mm long; *pollinarium* 1.5–2.5 mm long; *viscidium* more or less circular, c. 0.5 mm diam.; *pollinia* friable, mealy, white. *Stigma* situated at base of column, ovate-quadrate, 1.8–2.5 mm long, 1.6–2 mm wide, margins irregular. *Capsules* obovoid, 8–12 mm long, 4–6 mm wide, erect, ribbed. (Fig. 5 g–i; Plate 3, Fig. 27)

Selected specimens examined: QUEENSLAND: Cook District: Wild River Gorge, 8 km from Herberton, 5 vi. 1972, *J. Wrigley & I. Telford NQ742* (CANB *47708*); Kennedy South District: Crediton, 27 vii. 1994, *A. & S. Pearson DLJ13123* (CANB *96129691*); Leichhardt District: Spring Creek, Blackdown Tableland, 8 ix. 1988, *T. Pedersen DLJ2785* (CANB *88064471* & CANB *88064472*); Western Main Divide N of Herberton Range, 26 viii. 1954, *L.S. Smith 5300* (CANB *264760*); Kennedy South district: c. 4.2 km along The Diggings Road, Eungella National Park, 20 vi. 1993, *D.L. Jones 11682, C.H. Broers & S. Pearson* (CANB *9704701*); Moreton district: Mapleton State Forest, 21 viii. 1991, *R. Crane 694* (CANB *9202177*); Moreton District: Mt Ballow National Park, 18 viii. 1997, *R. Crane 1844* (CANB *9710461*); Port Curtis: Stockyard Point Byfield, viii. 1996, *R. Melzer RM730* (BRI *588081*). NEW SOUTH WALES: Pacific Highway, 12 miles S of Kempsey, 29 ix. 1969, *R. Coveny 2149* (NSW *171262*); Picton to Bargo, ix. 1891, (NSW *109540*); 6 km WNW of Mittagong, 26 xi. 1978, *J. Thompson 2981* (NSW & AD *98919110*); Mullumbimby, 6 ix. 1973, *T.B. Muir 5112* (MEL *2039733* & MEL *669884*); Wadalba, ix. 2001, *B. Branwhite JAJ1029* (MEL *2136713*); Warnervale, edge of Porters Creek wetland, ix. 2001, *B. Branwhite JAJ1032* (MEL *2136712*); 300m S of Ross Lane, Lennox Heads, 16 ix. 2001, *B. Dalyell JAJ1024* (MEL *2136735* & MEL *2136736*); Mittagong, *W.A. Dixon 2118* (NSW *156397*).

Distribution and habitat: Queensland and New South Wales where distributed widely between Mossman to just south of Sydney (Fig. 29). Also possibly occurs in Papua/New

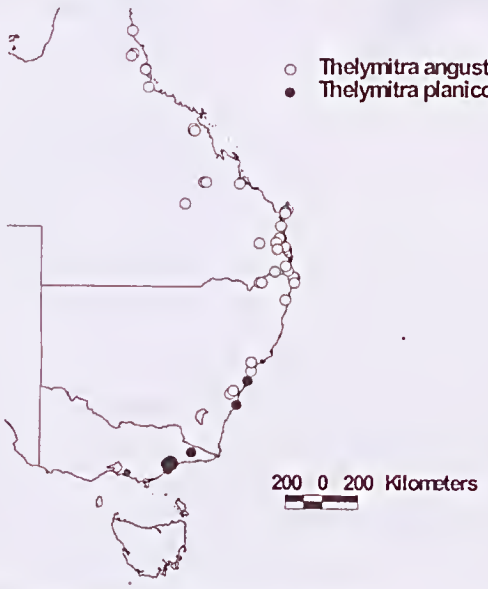

Figure 29. Distribution of *Thelymitra angustifolia* and *Thelymitra planicola*.

Guinea and New Caledonia. Found in a variety of habitats including open forest and woodland, but most often around the margins of rain forest and wet sclerophyll forest. Altitude: 0–1000 m.

Conservation status: Widespread and well conserved.

Flowering period: June to November.

Pollination biology: This species is facultatively autogamous.

Typification: The type sheet contains three specimens, all of similar appearance and apparently of common origin. The left hand specimen has only a single flower remaining and lacks the leaf. The middle specimen has three flowers remaining (at least an upper fourth flower is missing) and a leaf. The right hand specimen 'α' was designated as the lectotype by Clements (1989), probably because at that time it was the most complete of the three specimens, having an almost whole leaf and four flowers. Since then a flower from specimen 'α' has been removed, softened and stored in spirit by J.Z. Weber (AD *99005005*). Two of the plants have a long narrow leaf (about as long as the inflorescence). Two have three sterile bracts the other has two. All are of moderate height (to about 30 cm tall), slender and have up to four flowers. The flowers are small, the perianth segments 7–11.5 mm long, and probably self-pollinating as most of the ovaries are at least partially swollen.

Robert Brown in the *Prodromus* (Brown 1810) mistakenly gives the collection locality as Port Jackson (J), but the label on the type specimens gives the provenance as Port II (Port Clinton, Queensland, near Shoalwater Bay c. 100 km NNE of Rockhampton). Bennett gave the number 5572 to this particular collection.

Brown's Latin description (Brown 1810): *T. angustifolia*, perianthio patulo, cuculli laciniis extimis penicillatis: intermediâ dorso nudo emarginatâ lobulis dentatis, spicâ pauciflorâ, folio scapum aequante. (perianth widely spreading, side lobes penicillate: post-anther lobe naked, emarginate, lobules toothed, spike few-flowered, leaf equal to inflorescence.)

Notes: Plants consistent with Brown's description of *T. angustifolia*, and with the specimens on the type sheet, have been collected recently in various places in Queensland and northeastern New South Wales. This taxon appears to be relatively common and widespread, but under-collected and poorly known. The presence of other taxa in eastern Australia that bear several features in common with *T. angustifolia* has caused confusion. Several characters can be used in combination to define *T. angustifolia sensu stricto*. It flowers over a long interval between June and October and usually grows in open forests. The leaf is about as long as the inflorescence, narrow and thin-textured, rarely exceeding 10 mm wide, and the inflorescence is slender and up to 60 cm tall, usually with three sterile bracts. There are usually three to eight flowers that are autogamous and will open tardily only on very warm to hot days. The perianth segments are usually up to 13 mm long, about half as wide and blue to purplish in colour. The post-anther lobe is more or less tubular (widely open on the ventral side), not greatly inflated and shallowly bilobed at the apex. The lateral lobes are usually about 1.5 mm long and curve gently upwards. The trichomes on the lateral lobes are about 1 mm long and are arranged in dense sub-terminal mop-like bundles that embrace the tip of the post-anther lobe.

Thelymitra peniculata is similar to *T. angustifolia*, but the former has a shorter, fleshier, more channelled leaf and usually only two sterile bracts. It also has a more southerly distribution.

Although beyond the scope of this paper, it is interesting to note that all the *Thelymitra* specimens that I have seen from New Caledonia (usually identified as *Thelymitra sarasiniana* Kraenzl.) and from New Guinea (usually identified as *Thelymitra papuana* J.J.Sm.) are a good match for *T. angustifolia*. It is highly probable that the three taxa are conspecific, in which case *T. angustifolia* is the earliest name and should take

precedence. Hallé (1977) reduced *T. sarasiniana* to synonymy under *T. longifolia*, but Clements (1989) suggests that the two are separate species and that the former is endemic to New Caledonia. As stated earlier in this paper (see introduction), in my opinion *T. longifolia* is endemic to New Zealand. It differs from *T. augustifolia* and *T. sarasiniana* in its usually white flowers and the more toothbrush-like arrangement of the trichomes on the lateral lobes of the column.

14. *Thelymitra planicola* Jeanes, *Muelleria* 14: 94 (2000).

Type: Victoria. Golden Beach. SE edge of Lake Reeve, c. 200 m NE of causeway and adjacent to rare plant reserve, 26 x. 1999, *J.A. Jeanes 608* (holotype MEL!, isotypes MEL!, CANB!).

Illustrations: Jeanes (2000) fig. 1 e,f,g & h; fig. 5; Jeanes & Backhouse (2001) page 168.

Glabrous, somewhat glaucous terrestrial *herb*. *Tubers* not seen. *Leaf* linear to linear-lanceolate, 10–30 cm long, 5–20 mm wide, erect, leathery, canaliculate, ribbed abaxially, dark green with a purplish base, sheathing at base, apex acute. *Inflorescence* 22–45 cm tall, 2–5 mm diam., straight, purplish. *Sterile bracts* 2–4, linear to lanceolate, 2–8 cm long, 5–15 mm wide, green or purplish, lower ones often leaf-like, closely sheathing for most of their length, acute to acuminate. *Fertile bracts* ovate-acuminate to obovate-acuminate, 10–20 mm long, 4–8 mm wide, green or purplish, sheathing the pedicels. *Pedicels* 1–8 mm long, stout. *Ovary* cylindrical to narrow-obovoid, 3–12 mm long, 1.5–4 mm wide. *Flowers* 2–12, (15–)20–25(–30) mm diameter, medium blue with darker blue longitudinal veins, opening readily only on hot days. *Perianth segments* (7–)10–13(–15) mm long, 4–8 mm wide, concave, often shortly apiculate; *dorsal sepal* ovate to obovate, obtuse to subacute; *lateral sepals* ovate-lanceolate, slightly asymmetric, acute; *petals* ovate to obovate, obtuse to subacute; *labellum* oblanceolate to obovate, acute, often smaller than other segments; *column* erect from the end of ovary, 5–6 mm long, 3–4 mm wide, white to pale blue; *post-anther lobe* hooding the anther, 1.5–2 mm long, 1.5–2 mm wide, semi-cylindric, gently curved, mostly dark blackish brown with a thin blue collar, apex shallowly bilobed, yellow, lobes shallowly and irregularly toothed; *post-anther lobe extension* 0.5–1.2 mm; *auxiliary lobes* absent; *lateral lobes* converging, 1.2–2 mm long, digitiform to somewhat flattened, obliquely erect, curved, each with a short, terminal, mop-like arrangement of white trichomes, the individual trichomes 0.9–1.5 mm long. *Anther* inserted c. mid-way along column, basal part obscured behind stigma, ovoid, 2.7–4 mm long, 1.5–2.2 mm wide, connective produced into an apical beak c. 0.5 mm long; *pollinarium* 1.5–2.2 mm long; *viscidium* circular, c. 0.5 mm diam.; *pollinia* friable, mealy, white. *Stigma* situated at base of column, more or less quadrate, 2–2.5 mm long, 2–2.5 mm wide, margins irregular. *Capsules* obovoid, 10–16 mm long, 3.5–7 mm wide, erect, ribbed. (Fig. 6 a–c; Plate 3. Fig. 28).

Selected specimens examined: New South Wales: Cultivated CANB ex Orient Point, E of Nowra, 4 xi. 1988, *D.L. Jones 3422* (CANB *8807085*); Narrabeen, suburb of Sydney, 1 x. 1954, *A.W. Dockrill & B.B. Lowry 815* (AD *97631544*). Victoria: Gippsland Lakes Reserve, 27 x. 1984, *A.C. Beauglehole 78814 & J.R. Turner* (MEL *669448*); Providence Ponds Flora and Fauna Reserve, 22 x. 1984, *A.C. Beauglehole 78729* (MEL *670413*); Golden Beach, SE edge of Lake Reeve, 4 xi. 1996, *J.A. Jeanes 258* (MEL *2034950*); Rail Reserve WSW of Lindenow South, 27 x. 1999, *J. Turner JAJ633* (MEL *2069954*); Bairnsdale, 24 x. 1987, *R.J. Bates 11393* (CANB *478099* specimen 2); Marlo Airport, 15 xi. 1987, *R.J. Bates 12172* (AD *98753040*).

Distribution and habitat: Eastern Victoria and the central coast of New South Wales. Most collections are from the eastern section of the Gippsland Plain Natural Region (Conn 1993), between Sale and Bairnsdale, Victoria, with disjunct collections from near Marlo and from New South Wales, east of Nowra and near Sydney (Fig. 29). Grows in

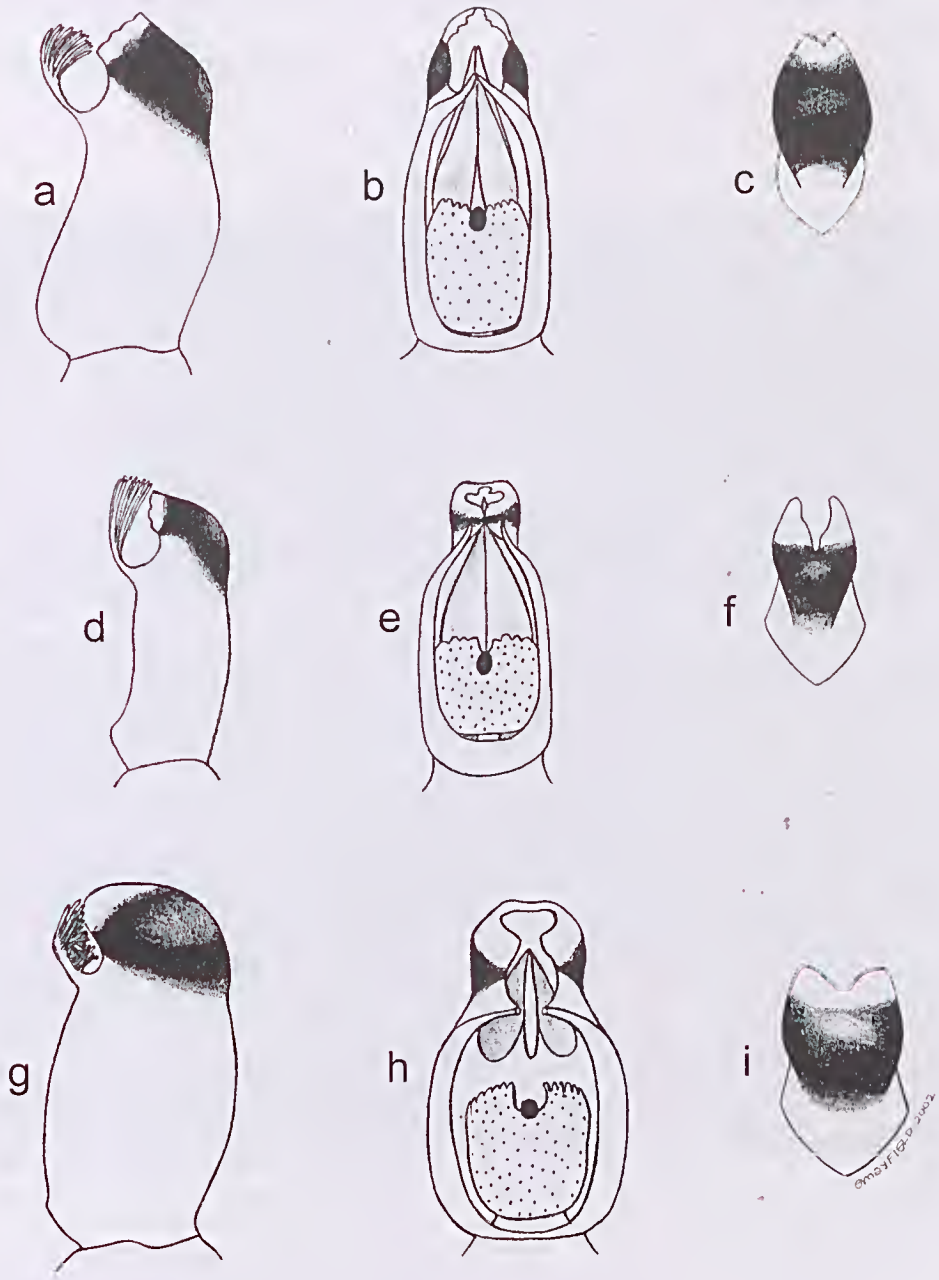

Figure 6.
Thelymitra planicola: **a** column from side x 8; **b** column from front x 8; **c** post-anther lobe from rear x 8
Thelymitra vulgaris: **d** column from side x 8; **e** column from front x 8; **f** post-anther lobe from rear x 8
Thelymitra arenaria: **g** column from side x 8; **h** column from front x 8; **i** post-anther lobe from rear x 8

herb-rich grassland and grassy woodland and heathland on soils ranging from sandy loams to clay loams. Altitude: 0–80 m.

Conservation status: Known from only about six colonies and very few plants. Suggest 3EC by criteria of Briggs & Leigh (1996).

Flowering period: Late October to early November.

Pollination biology: This species is facultatively autogamous.

Notes: *Thelymitra planicola* is a very distinctive species that is characterised by its overall glaucous appearance, moderately tall habit, large leaf-like lower sterile bracts, short pedicels, medium-blue, longitudinally veined flowers mostly 20 to 25 mm in diameter, and the short, semi-cylindric post-anther lobe. The structure of the post-anther lobe is unique for the group, so identification of fresh and spirit-preserved specimens is relatively simple. In the dried and pressed state however, *T. planicola* may be difficult to differentiate from *T. pauciflora*, although the persistent glaucous appearance of the leaf, scape, bracts and ovaries, and the often leaf-like lower sterile bracts are useful distinguishing characters.

The structure of the post-anther lobe of *T. planicola* is somewhat intermediate between those of *Thelymitra aristata* Lindl. and *T. pauciflora sens. lat.*, but these two taxa have not been recorded growing sympatrically with *T. planicola*, so the latter is unlikely to be of recent hybrid origin.

15. *Thelymitra vulgaris* Jeanes *sp. nov.*

T. pauciflorae R.Br. affinis sed bractea sterili solitaria, inflorescentia floribus pluribus generatim composita, lobo post-antheram inflatiore leviter, columna dilatata apicem versus, ad apicem incisum profunde differt.

Type: Western Australia. Warradale Road, c. 3 km from Brookton Highway, 15 x. 2000, *J.A. Jeanes 842, C. French & H. Beyrle* (holotype MEL; isotypes MEL, PERTH).

Thelymitra pauciflora sensu N. Hoffman & A. Brown, *Orchids of South-west Australia*—revised second edition with supplement 263 (1998), *non* R.Br. (1810).

Thelymitra graminea sensu N. Hoffman & A. Brown, *Orchids of South-west Australia*—revised second edition with supplement 265 (1998), *non* Lindl. (1840).

Illustrations: Hoffman & Brown (1998) pages 263 (as *T. pauciflora*) & page 265 (as *T. graminea*).

Glabrous terrestrial *herb*. *Tubers* not seen. *Leaf* linear to linear-lanceolate, 10–20(–30) cm long, 4–8(–12) mm wide, erect, canaliculate, fleshy or leathery, ribbed abaxially, dark green with a purplish base, sheathing at base, apex acuminate. *Inflorescence* 10–30(–40) cm tall, 1–2.7 mm diam., slender, straight, pale green to dark green, straw-coloured or purplish. *Sterile bracts* usually 1, rarely 2, linear to linear-lanceolate, 2–7.5 cm long, 3.5–7.5 mm wide, green to purplish, closely sheathing, apex sometimes free and diverging from scape, acuminate. *Fertile bracts* ovate-acuminate to obovate-acuminate, 4–15(–24) mm long, 3–6 mm wide, sheathing the pedicels, green to purplish. *Pedicels* 1–15 mm long, slender. *Ovary* narrow-obovoid, 5–12 mm long, 2–3.5 mm wide. *Flowers* 2–5(–9), 15–20(–25) mm diameter, usually pale blue, mauve or purplish, less often white, opening tardily only on warm to hot days. *Perianth segments* 6–10(–13) mm long, 2.5–5 mm wide, concave, often shortly apiculate; *dorsal sepal* lanceolate to ovate-lanceolate, obtuse to acute; *lateral sepals* lanceolate to ovate-lanceolate, often slightly asymmetric, acute; *petals* ovate-lanceolate to ovate, obtuse to acute; *labellum* lanceolate to ovate-lanceolate, acute, only slightly smaller than other segments. *Column* erect from the end of ovary, 4–5 mm long, 1.8–2.5 mm wide, white to pale blue; *post-anther lobe* hooding the anther, 2–2.5 mm long, 1–1.5 mm wide, tubular,

Plate 3. Figure 27. *Thelymitra angustifolia* Newcastle area, New South Wales (photograph by B.Branwhite); **Figure 28**. *Thelymitra planicola* Sale area, Victoria (photograph by J.A.Jeanes); **Figure 30**. *Thelymitra arenaria* Brisbane Ranges, Victoria (photograph by J.A.Jeanes); **Figure 31**. *Thelymitra batesii* Spring Gully C.P., South Australia (photograph by J.A.Jeanes); **Figure 33**. *Thelymitra frenchii* Jarrahdale, Western Australia (photograph by C.J.French); **Figure 34**. *Thelymitra uncida* Wilsons Promontory, Victoria (photograph by J.A.Jeanes)

Plate 4. Figure 36. *Thelymitra lucida* Brisbane Ranges, Victoria (photograph by J.A.Jeanes); **Figure 37.** *Thelymitra inflata* Adelaide Hills, South Australia (photograph by M.Houston); **Figure 39.** *Thelymitra holmesii*: Wilsons Promontory, Victoria (photograph by J.A.Jeanes); **Figure 40.** *Thelymitra vulgaris* Darling Ranges, Western Australia (photograph by J.A.Jeanes); **Figure 41.** *Thelymitra xanthotricha* Darling Ranges, Western Australia (photograph by J.A.Jeanes)

widely open on ventral side, gently curved, reddish brown, apex deeply v-notched, yellow, distal margin not thickened, often shallowly and irregularly toothed; *post-anther lobe extension* 0.2–0.6 mm; *auxiliary lobes* absent; *lateral lobes* converging, 1.2–1.5 mm long, digitiform, porrect at base, curving gently upwards, each with a toothbrush-like arrangement of white trichomes along the distal half, the individual trichomes c. 0.5 mm long, gland-tipped. *Anther* inserted near centre of column, ovoid, 1.8–2.2 mm long, 1–1.5 mm wide, the connective produced into an apical beak 0.2–0.5 mm long; *pollinarium* 1.4–1.8 mm long; *viscidium* elliptic to more or less circular, c. 0.3 mm diam.; *pollinia* mealy, friable, white. *Stigma* situated at base of column, ovate-quadrate, 1.2–1.8 mm long, 1.2–1.8 mm wide, margins irregular. *Capsules* obovoid, 8–18 mm long, 3.5–6 mm wide, erect, ribbed. (Fig. 6 d–f; Plate 4. Fig. 40)

Selected specimens examined: WESTERN AUSTRALIA: Toolbrunup Road at the intersection with Aylmore Road. About 14 km ESE of Tumbellup, 17 x. 2000, *J.A. Jeanes 849* (MEL *2087480*, MEL *2093571* & PERTH); Mt Barker–Denmark Rd, c. 1 km NE of Harvey Road, 19 x. 2000, *J.A. Jeanes 853* (MEL *2093574*, MEL *2093575* & PERTH); Rock outcrop in Mehinup Nature Reserve c. 31 km E of Walpole, 19 x. 2000, *J.A. Jeanes 856 & W. Jackson* (MEL *2087474*, MEL *2087475* & PERTH); N edge of Lake Muir c. 1.5 km E of Thompson Rd, 20 x. 2000, *J.A. Jeanes 861* (MEL *2093612*, MEL *2093613* & PERTH); Capel–Donnybrook Rd, c. 4.7 km from Gibson Road towards Capel, 22 x. 2000, *J.A. Jeanes 868* (MEL *2093586*, MEL *2093587* & PERTH); Cranbrook–Boyup Brook Rd, W corner of Frankland turnoff, c. 10 km from Cranbrook, 21 x. 1998, *R.L. Heberle ORG1680* (CANB *610413*); Darling district: Lathams Hill, W of Wagin, 8 x. 1991, *D.L. Jones 8228* (CANB *610412*); Darling district: 18.1 km W of Mt Barker, Frankland River, E side, 12 x. 1991, *D.L. Jones 8383a* (CANB *611744*); Darling district: 5 km N of Manjimup beside road to Bridgetown, 10 x. 1991, *D.L. Jones 8296* (CANB *611741*); Roe district: The Humps, c. 20 km N of Wave Rock on Southern Cross road, 12 x. 1988, *D.L. Jones 3036* (CANB *8806699*).

Distribution and habitat: Endemic to southwestern Western Australia where very widespread (Fig. 42). Grows in a wide variety of habitats including open forest, woodland, heathy woodland and mallee scrub, often around swamp margins, near watercourses or on rock outcrops. Altitude: 0–500 m.

Conservation status: Widespread, often locally common and well conserved.

Flowering period: Late September to early November.

Pollination biology: This species is facultatively autogamous and often also cleistogamous.

Notes: *Thelymitra vulgaris* has been confused with *T. pauciflora*, but the two species are quite distinct morphologically as well as geographically. The former is confined to southwestern Western Australia, the latter to southeastern Australia. *Thelymitra pauciflora* has a generally narrower leaf, usually two sterile bracts, generally fewer flowers, a less inflated post-anther lobe that is more or less entire to emarginate at the apex and mop-like tufts of trichomes on the lateral lobes.

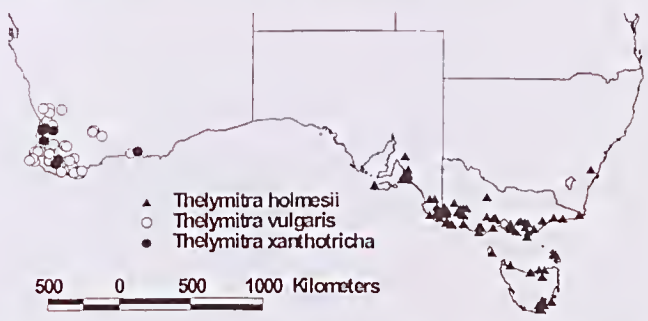

Figure 42. Distribution of *Thelymitra holmesii*, *Thelymitra vulgaris* and *Thelymitra xanthotricha*.

Thelymitra vulgaris has also been confused with *T. graminea*, but the latter is a generally larger flowered species belonging to the *T. macrophylla* allianee.

Thelymitra vulgaris occasionally hybridises with *T. macrophylla sens. lat.* produeing plants of intermediate morphology.

Etymology: From the Latin *vulgaris*, common, usual; this is one of the most common and widespread *Thelymitra* speeies in Western Australia.

16. *Thelymitra arenaria* Lindl., *Gen. sp. pl.* 519–20 (1840)

Type: Tasmania, Circular Head, xi. 1837, *R. Gunn 937* (leetotype 6β K-L!, *fide* Clements 1989).

Illustrations: Jeanes & Backhouse (2001) page 171 figs A–C (as *Thelymitra* sp. aff. *panciflora* 2).

Glabrous terrestrial *herb*. *Tubers* not seen. *Leaf* linear-laneeolate, 15–30 em long, 8–18 mm wide, ereet, scabrous, leathery, canaliculate, ribbed abaxially, dark green with a purplish base, sheathing at base, apex acute to aeuminate. *Inflorescence* 25–40 em tall, 1.5–4 mm diam., straight, pale green to straw-coloured. *Sterile bracts* usually 2, oceasionally 1, linear to linear-laneeolate, 2.5–8.5 cm long, 4–11 mm wide, elosely sheathing, green and purplish, acute to aeuminate. *Fertile bracts* ovate-aeuminate to obovate-acuminate, 6–22 mm long, 4–7 mm wide, green and purplish, sheathing the pedieels. *Pedicels* 4–15 mm long, slender. *Ovary* narrow-obovoid, 5–12 mm long, 2–3.5 mm wide. *Flowers* 2–12, (16–)20–26 mm diameter, usually purplish, opening only on hot days. *Perianth segments* (8–)10–15 mm long, 4–8 mm wide, concave, often shortly apiculate; *dorsal sepal* ovate to elliptic, obtuse to subacute; *lateral sepals* narrow-ovate to elliptic, slightly asymmetric, acute; *petals* ovate to elliptic, obtuse to subacute; *labellum* narrow-ovate to elliptic, acute, slightly smaller than other segments; *column* ereet from the end of ovary, 4.5–6 mm long, 2.5–3.5 mm wide, mostly pale blue with darker blue streaks; *post-anther lobe* hooding the anther, 2–3 mm long, 1.8–2.3 mm wide, tubular, inflated, gently curved through e. 90°, mostly dark brown, apex emarginate to shallowly bilobed, yellow, lobes 0.5–1.1 mm long; *post-anther lobe extension* 0.5–1.3 mm; *auxiliary lobes* absent or sometimes present as 2 tiny ineurved spurs on the apical margin of the post-anther lobe; *lateral lobes* eonverging, 0.8–1.2 mm long, digitiform, porrect at base then bent sharply upwards through e. 90° near the middle, each with a toothbrush-like arrangement of white trichomes along most of their length, the individual trichomes 0.7–1 mm long. *Anther* inserted towards apex of column, ovoid, 2.5–3 mm long, 1.5–2 mm wide, the connective produced into an apieal beak 0.4–0.7 mm long; *pollinarium* 1.9–2.4 mm long; *viscidium* more or less circular, e. 0.5 mm diam.; *pollinia* friable, mealy, white. *Stigma* situated at base of eolumn, ovate-quadrate, 1.5–2.2 mm long, 1.8–2.5 mm wide, margins irregular. *Capsules* obovoid, 10–15 mm long, 4–6 mm wide, erect, ribbed. (Fig. 6 g–i; Plate 3. Fig. 30)

Selected specimens examined: South Australia: Southern Lofty Region: National Park, Belair, 8 x. 1911, *R.S. Rogers s.n.* (AD *97725215*);); Mount Lofty Range: SE side of Clarendon to Kangarilla Rd at Bakers Gully Road turnoff, 2 xi. 1969, *R.C. Nash s.n.* (AD *97003273*); Southern Lofty Region: Kennet-Stirling Conservation Park near Bridgewater Park, 4 xi. 1990, *J.Z. Weber 10204* (AD *99037083*); Kangaroo Island Region: American Beach/Brown Beach area c. 10.2 km from Penneshaw, ix. 2000, *D.L. Jones 16813* (MEL *2136731* & CANB *606708*); c. 4 km SE of Naracoorte, 22 x. 2001, *K. Alcock JAJ1072* (MEL *2136730*); Southern Lofty Region: Scott Creek Conservation Park, 18 x. 2001, *R.J. Bates JAJ1294* (MEL *2136718*); Southern Lofty Region: Upper Waterfall Gully, 14 x. 1966, *Hj. Eichler 18794* (AD *96650441*). New South Wales: Southwest Slopes: Nailean Range, Albury, 4 xi. 1999, *P.G. Branwhite 43* (CANB *622597*). Australian Capital Territory: Brindabella Ranges, c. 7.3 km along Bendora Dam Rd from Bulls Head, 24 xi. 1991, *D.L. Jones 8568 & B.E. Jones* (CANB *9803959*); Black Mountain, 28 x. 1953, *E. Gauba s.n.* (CANB *14377*). Victoria: Wannon: Apsley, 11 x. 1996, *K. Alcock s.n.* (MEL *2032963*);

Beside Calder Hwy, 6 km SE of Harcourt, 9 xi. 1970, *T.B. Muir 4895* (MEL *518815*); Morrl Morrl, 26 km NE of Stawell, in State Forest, 18 x. 1980, *T.B. Muir 6490* (MEL *581494*); Beside railway line, 3 miles west of Yea, 28 x. 1964, *T.B. Muir 3561* (MEL *221682*); 8.5 km W of Bacchus Marsh, near northwest railway line, 11 xi. 1976, *T.B. Muir 5469* (MEL *114546*); Whroo Forest, Whroo, 7 km SSW of Rushworth, 27 x. 1974, *T.B. Muir 5373* (MEL *114551*); About 3 km SSE of Macedon, near railway line, 9 xi. 1970, *T.B. Muir 4893* (MEL *518816* & MEL *2039683*); 0.5 km SW of Broadford, in railway reserve, 12 x. 1978, *T.B. Muir 6162* (MEL *565912* & MEL *2039750*); Volcanic Plain, Inverleigh Common Flora Reserve, 30 km W of Geelong, 3 xi. 1991, *T.J. Entwisle 2124* (MEL *2016283* & MEL *2046963*); Cosstick Wildflower Reserve, 5 km WSW of Maryborough P.O., 26 x. 1981, *A.C. Beauglehole 69475 & L. & E. Courtney* (MEL *1530851*). TASMANIA: Symmons Plains, 5 xi. 1974, *W.M. Curtis s.n.* (HO *410817*); Kapi Creek, 4 xii. 1981, *D.I. Morris 81221* (HO *409314*); Barossa Road, Lenah Valley, ix. 1950, *J.F. Thompson s.n.* (HO *97695*); Mt Cameron, 18 xi. 1983, *A. Moscal 4170* (HO *94555*); Sisters Beach, near store, 31 x. 1998, *D.L. Jones 16019 & M. Garratt* (CANB *605652*); Duck Bay, 25 x. 1997, *L. Hyatt ORG983* (CANB *609362*); Campbell Town Golf Course, 21 xi. 1995, *H. Wapstra DLJ14684* (CANB *9609757*); Wynyard Cemetery, 2 xi. 1990, *D.L. Jones 6921 & C.H. Broers* (CANB *9016391*); Moorina Cemetery, 9 xi. 1990, *D.L. Jones 7133 & C.H. Broers* (CANB *9614230*); Risdon, 29 x. 1992, *J.E. Wapstra DLJ10565* (CANB *9702414*); Mount Wellington, Lenah Valley Track, 14 xii. 1993, *M. Wapstra DLJ12745* (CANB *9603651*).

Distribution and habitat: Southeastern Australia, mostly Victoria and Tasmania but extending to the Mount Lofty Ranges of South Australia and soútheastern New South Wales including the Australian Capital Territory (Fig. 32). Grows in a wide variety of habitats including open forest, woodland, heathland and scrubland. Altitude: 5–1000 m.

Conservation status: Widespread, reasonably common and well conserved.

Flowering period: October to December.

Pollination biology: This species is facultatively autogamous.

Typification: The type sheet contains seven specimens with two labels, representing two separate collections. The three specimens on the left have Gunn's number 943α, and were collected in December to January 1837 at Circular Head, Tasmania. The four specimens on the right have Gunn's number 937, and were collected in November 1837, also at Circular Head. All seven specimens are of fairly uniform appearance and both

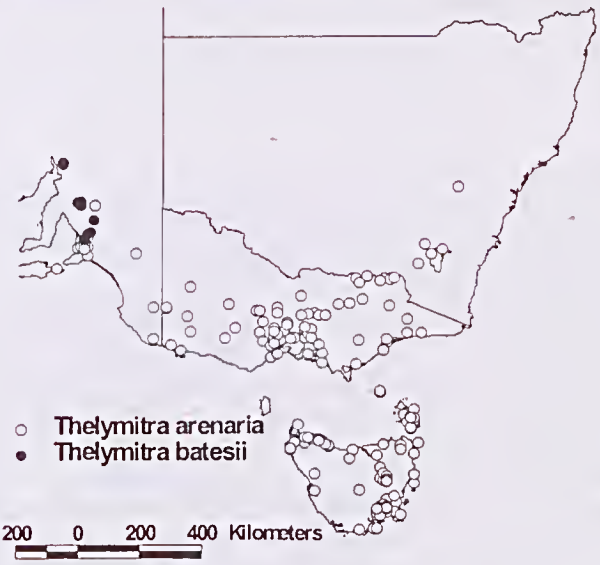

Figure 32. Distribution of *Thelymitra arenaria* and *Thelymitra batesii*.

collections were cited by Lindley in the protologue. Each collection is accompanied by a sketch of the column, apparently executed by Lindley, and these also show some similarities. In 1984, Clements softened and drew a dissected flower taken from a specimen belonging to each collection (Clements pers. comm.). The column from the 943α specimen has the lateral lobes with more or less terminal trichomes, while the trichomes on the lateral lobes of the 937 specimen are distributed almost along their entire length. This fact together with the disparity in flowering times and Gunn's allocation of discrete numbers would suggest that the two collections are of different taxa. Since Clements (1989) designated collection 937 as the lectotype of *T. arenaria*, collection 943α should not be considered as part of the type. In fact, collection 943α appears referable to the new species *T. peniculata* (described above in this paper), a common species often sympatric with *T. arenaria*. Although all four plants of the lectotype have open or partially open flowers, and Lindley describes the flowers as spreading, this could be due simply to the fact that the plants were collected and pressed on a hot day.

Lindley's Latin description (Lindley 1840b): *T. arenaria*. T. folio lineari, racemo 2–6-floro, cuculli emarginati glabri laciniis lateralibus petiolatis stuposis, floribus purpureis patulis. (*Thelymitra* with leaf linear, raceme 2–6-flowered, hood emarginate, glabrous, lateral flap stalked with matted hair, flowers purple, spreading).

Notes: Plants consistent with Lindley's description, sketch and notes on *T. arenaria*, and with collection 937 on the type sheet, are common in northwestern Tasmania and have been collected recently and studied. This taxon is relatively common and widespread throughout much of southeastern Australia, but remains poorly known today due to the presence of several superficially similar taxa. A combination of characters can be used to define *T. arenaria sensu stricto*. It is a moderately tall, slender species with a long, narrow, fleshy leaf, and usually two sterile bracts. There are up to 12 autogamous flowers that open only on warm to hot days. The perianth segments are usually about 10 mm long, but may be as long as 15 mm, about half as wide and usually purplish in colour. The post-anther lobe is more or less tubular, widely open on the ventral side, inflated and emarginate at the apex. The lateral lobes are up to 1.2 mm long and bend upwards sharply (at c. 90°) near their middle. The trichomes on the lateral lobes are up to 1 mm long and are arranged in very dense toothbrush-like tufts along virtually their entire length.

The column structure of *T. nuda* is virtually identical to that of *T. arenaria*, but the former is generally a more robust species with larger, entomophilous flowers and a larger column. Intermediates have often been observed and collected, and these may represent hybrid swarms.

17. *Thelymitra batesii* Jeanes, *sp. nov.*

T. pauciflorae R.Br. affinis sed inflorescentia floribus pluribus generatim composita, lobo post-antheram columnae inciso profunde saepe et lobis lateralibus curvatis (non flexibus acute) et trichomatibus longioribus instructis differt.

Type: South Australia. Spring Gully Conservation Park, Cascades Walk, 16 x. 2002, *J.A. Jeanes 1252* (holotype AD; isotypes CANB, MEL, NSW, HO, BRI).

Glabrous terrestrial *herb*. *Tubers* not seen. *Leaf* linear to linear-lanceolate, 10–30 cm long, 5–11 mm wide, erect, canaliculate, fleshy, ribbed abaxially, dark green with a purplish base, sheathing at base, apex acute to acuminate. *Inflorescence* 20–45 cm tall, 1.5–2.5 mm diam., slender, straight, green to purplish. *Sterile bracts* usually 2, linear to linear-lanceolate, 2–7 cm long, 4–8 mm wide, closely sheathing, acute to acuminate, green to purplish. *Fertile bracts* ovate-acuminate to obovate-acuminate, 7–20 mm long, 4–7 mm wide, sheathing the pedicels, green to purplish. *Pedicels* 0.5–10 mm long, slender. *Ovary* narrow-obovoid, 4–11 mm long, 2–3.5 mm wide. *Flowers* 2–8, 14–22

mm diameter, opening tardily on warm to hot days, usually mauve or bluish purple inside, outside of sepals pinkish with darker longitudinal stripes, unopened flower buds inflated. *Perianth segments* 6–10 mm long, 3.5–6.5 mm wide, concave, often shortly apiculate; *dorsal sepal* ovate, obtuse to subacute; *lateral sepals* lanceolate to ovate, often asymmetric, acute; *petals* ovate to obovate, obtuse to subacute; *labellum* obovate to oblanceolate, acute, often slightly smaller than other segments. *Column* erect from the end of ovary, 4.5–5.5 mm long, 2.5–3.5 mm wide, pink or purplish; *post-anther lobe* hooding the anther, 2.5–3.5 mm long, 1.9–2.7 mm wide, tubular, often somewhat compressed dorsally, curving abruptly through c. 90°, dark purplish, apex deeply bilobed, yellow, the lobes 1–1.5 mm long, margins thickened and recurved; *post-anther lobe extension* 0.5–0.8 mm; *auxiliary lobes* often present as 2 small incurved spurs on the lower apical margin of the post-anther lobe, sometimes touching near tip of anther beak; *lateral lobes* converging or more or less parallel, 1.3–1.7 mm long, digitiform, porrect at base, curving gently upwards, each with a sub-terminal, mop-like, dense, untidy tuft of trichomes that embrace the apex of post-anther lobe, the individual trichomes 1.1–1.5 mm long, white. *Anther* inserted about mid-way along column, ovoid, 2.5–3 mm long, 1.7–2.2 mm wide, the connective produced into an apical beak 0.5–0.7 mm long; *pollinarium* 1.9–2.5 mm long; *viscidium* more or less circular, c. 0.4 mm diam.; *pollinia* mealy, friable, white. *Stigma* situated at base of column, ovate-quadrate, 1.8–2.5 mm long, 1.7–2 mm wide, margins irregular. *Capsules* obovoid, 10–18 mm long, 4–7 mm wide, erect, ribbed. (Fig. 4 a–c; Plate 3, Fig. 31)

Selected specimens examined: South Australia: Southern Lofty Region: Flora reserve on the Kersbrook–Williamstown Road, c. 6.5 km N of Kersbrook, 15 x. 2002, *J.A. Jeanes 1247* (MEL *2144479* & MEL *2144480*); Northern Lofty Region: Hughes Park via Sevenhill, x. 2000, *R.J. Bates 57681* (MEL *2100132*); Mt Lofty Range, Stonyfell, Ferguson Recreation Park, 7 x. 1973, *K. Preiss 260* (AD *97351306*); Northern Lofty Region: Emu Flat Native Reserve via Clare, 9 x. 1999, *R.J. Bates 54361* (AD *111895*); Southern Lofty Region: Above the Little Para crossing Para Wirra, 9 x. 1996, *R.J. Bates 44805* (AD *99826175*); Flinders Ranges Region: Alligator Gorge, xi. 1997, *R.J. Bates 42625* (AD *99841285*); Northern Lofty Region: 10 km N of Nuriootpa, 25 x. 1992, *R.J. Bates 29514* (AD *99321292*).

Distribution and habitat: Apparently endemic to South Australia where found in hill country in the Northern Lofty and Southern Lofty Regions (Fig. 32). Grows in heathy woodlands and heathy open forests in sandy or gravelly clay loams. Altitude: 300–600 m.

Conservation status: Widespread, reasonably common and conserved.

Flowering period: Late September to early November.

Pollination biology: This species is facultatively autogamous.

Notes: *Thelymitra batesii* is a slender species with a long, fairly narrow leaf. The inflorescence usually has two to eight flowers that open tardily and have mauve to bluish purple perianth segments that are short (mostly 6–10 mm long) and broad (mostly 3.5–6.5 mm wide). The mature unopened flower buds are distinctive, having a plump appearance with the exterior of the sepals pinkish with darker longitudinal veins. The column is usually about half the length of the perianth segments. The post-anther lobe is large, dorsally compressed, inflated and deeply bifid at the apex. The lateral lobes usually curve upwards gently and are terminated by a dense, semi-erect tuft of white trichomes to about 1.5 mm long. At least the proximal quarter to half of the lateral lobes is glabrous.

Thelymitra batesii has been confused with *T. peniculata* and *T. brevifolia*; it can be distinguished from the former by its less robust habit, generally narrower leaf, the flower buds that are short and plump and the exterior of the sepals that is pink and longitudinally striped and from the latter by its proportionately longer and narrower leaf, purplish and yellow post-anther lobe that is more regularly notched and the lateral lobes that have larger tufts with longer trichomes.

Etymology: Named after Robert (Bob) J. Bates (1946–), field naturalist, orchid enthusiast and author. Bob has an enormous knowledge of Australian orchids, in particular those of South Australia, and was probably the first person to recognise *T. batesii* as a distinct species. Bob has also been of immeasurable help during my research on *Thelymitra* by supplying me with specimens and with information.

18. *Thelymitra frenchii* Jeanes, *sp. nov.*

T. granitorae D.L.Jones & M.A.Clem. affinis sed lobo post-antheram columnae non obstipo, floribus minoribus generatim et azureis intense, bractea sterili infera bifida interdum differt.

Type: Western Australia. Darling District: Blue Rock near Jarrahdale, 13 x. 2002, *C.J. French 3565* (holotype MEL; isotypes PERTH, CANB).

Glabrous terrestrial *herb*. *Tubers* not seen. *Leaf* linear-lanceolate, 6–12 cm long, 5–12 mm wide, more or less erect to curved strongly away from scape, canaliculate, fleshy, scabrous, pale green, ribbed abaxially, sheathing at base, apex acute. *Inflorescence* 5–14 cm tall, 1.5–3 mm diam., stout, straight, purplish. *Sterile bracts* 1 or 2, linear-lanceolate, 1.5–4 cm long, 4–8 mm wide, free for much of their length and diverging from scape, acute to acuminate, green to purplish, lower bract sometimes deeply bifid, the lobes 15–25 mm long, acute to acuminate. *Fertile bracts* ovate-acuminate to obovate-acuminate, 7–20 mm long, 4–7 mm wide, sheathing the pedicels, green to purplish, occasionally the proximal margins of lowest bract connate. *Pedicels* 6–15 mm long, slender. *Ovary* cylindrical to narrow-obovoid, 5–10 mm long, 2.5–3.5 mm wide, curved. *Flowers* 1–3, 18–25 mm diameter, blue, opening freely even in cool weather and remaining open until late in the day. *Perianth segments* 8–12 mm long, 3.5–6 mm wide, concave, often shortly apiculate; *dorsal sepal* ovate, distal margins often incurved, acute; *lateral sepals* lanceolate to ovate, slightly asymmetric, distal margins often incurved, acute; *petals* ovate, acute; *labellum* lanceolate, acute, usually slightly smaller than other segments. *Column* erect from the end of ovary, 5–5.5 mm long, 2.5–3 mm wide, pale blue; *post-anther lobe* hooding the anther, 2–3 mm long, 1.5–2.2 mm wide, tubular, widely open on ventral side, slightly inflated, truncate, mostly yellow with a narrow purplish collar, apex shallowly but widely v-notched, distal margin more or less smooth; *post-anther lobe extension* 0.4–0.6 mm; *auxiliary lobes* absent; *lateral lobes* converging, 1–1.3 mm long, digitiform, more or less erect, each with a toothbrush-like arrangement of white trichomes along most of their length, the individual trichomes 0.6–0.9 mm long. *Anther* inserted about mid-way along column, ovoid, 2–3 mm long, 1.5–2.5 mm wide, connective produced into a beak 0.4–0.6 mm long; *pollinarium* 1.5–2.5 mm long; *viscidium* more or less circular, c. 0.5 mm diam.; *pollinia* friable, mealy, white. *Stigma* situated at base of column, ovate-quadrate, 1.5–2.5 mm long, 1.5–2.2 mm wide, margins irregular. *Capsules* obovoid, 9–15 mm long, 4–6 mm wide, erect, ribbed. (Fig. 4 d–f; Plate 3. Fig. 33)

Specimens examined: Western Australia: Darling District: Near Jarrahdale, 14 x. 2001, *C.J. French 3215* (MEL *2144483*).

Distribution and habitat: Western Australia. Known with certainty only from a single locality near the town of Jarrahdale, which is c. 50 km southeast of Perth (Fig. 35). Grows in soil pockets on a granite rock outcrop in *Eucalyptus marginata* (Jarrah) forest. Reports of this species occurring on other rock outcrops in the region are in need of confirmation. Altitude: c. 300 m.

Conservation status: Currently known with certainty from only about 150 plants at the type locality and critically endangered. Suggest 2E by criteria of Briggs & Leigh (1996).

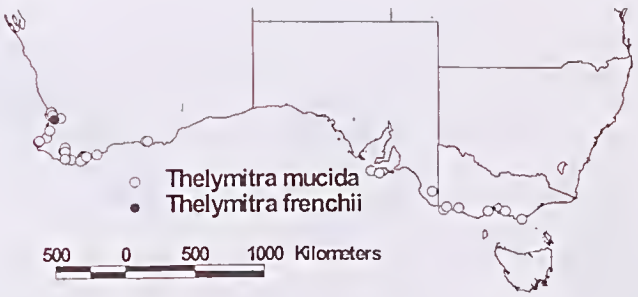

Figure 35. Distribution of *Thelymitra mucida* and *Thelymitra frenchii*.

Flowering period: October.

Pollination biology: The friable, mealy pollen and high level of seed capsule production would suggest that this species is most likely facultatively autogamous.

Notes: *Thelymitra frenchii* is a distinctive species that is probably related most closely to *Thelymitra granitora* (generally regarded as a member of the *T. nuda* complex) with which it shares a fondness for growing in shallow soil pockets on granite rocks, a short, stocky habit, a long, curved, fleshy leaf and self-pollinating flowers. However, the post-anther lobe in *T. frenchii* is a different shape and is more or less continuous with the base of the column (i.e. it doesn't curve forward through about 90° like that of *T. granitora*). Also the flowers are generally smaller and deeper blue in colour and the lowest sterile bract is sometimes deeply bifid. The flowers of this species remain open late into the day when other nearby *Thelymitra* species have their flowers already closed.

Etymology: Named after Christopher (Chris) J. French (1958–), field naturalist, orchid enthusiast and probably the first person to recognise the uniqueness of this species. Chris has been of immeasurable help during my research on *Thelymitra* by supplying me with specimens (including the type of *T. frenchii*) and acting as guide and companion during my Western Australian field trips.

19. *Thelymitra mucida* Fitzg., *Gard. Chron.* new ser. 17: 495 (1882).

Type: Wilson's Inlet, Western Australia, ix., *R.D. Fitzgerald s.n.* (lectotype α, β & γ BM! *fide* A.S.George 1971; isolectotypes BM!, NSW!).

Illustrations: Fitzgerald (1885) 2: 2; Nicholls (1969) Plate 21; Backhouse & Jeanes (1995) page 353; Hoffman & Brown (1998) page 262; Jeanes & Backhouse (2001) page 173.

Glabrous terrestrial *herb*. *Tubers* not seen. *Leaf* linear, 10–30 cm long, 2–8 mm wide, erect, fleshy, canaliculate, ribbed abaxially, dark green with a purplish base, sheathing at base, apex acute to acuminate. *Inflorescence* 18–55 cm tall, 0.8–2 mm diam., slender, straight, green to purplish. *Sterile bracts* usually 2, rarely 3, linear to linear-lanceolate, 2–4 cm long, 2.5–5 mm wide, closely sheathing, acute to acuminate, green to purplish. *Fertile bracts* ovate-acuminate to obovate-acuminate, 6–12 mm long, 3–6 mm wide, sheathing the pedicels, green to purplish. *Pedicels* 0.5–12 mm long, slender. *Ovary* narrow-obovoid, 5–12 mm long, 2–3.5 mm wide. *Flowers* 1–6, 14–22 mm diameter, pale to dark blue or purplish often also with strong pinkish tones, opening tardily on warm to hot days. *Perianth segments* 6–12 mm long, 3–6.5 mm wide, concave, broad and overlapping, often shortly apiculate; *dorsal sepal* ovate, subacute to obtuse; *lateral sepals* ovate, acute to obtuse; *petals* ovate, obtuse; *labellum* ovate-lanceolate to lanceolate, more or less acute, usually smaller than other segments. *Column* erect from the end of ovary,

4–6 mm long, 2.5–3.7 mm wide, blue or pinkish; *post-anther lobe* hooding the anther, 2.5–3.5 mm long, 1.5–2.5 mm wide, tubular, inflated, narrowly open on the ventral side, narrow at base, widening abruptly towards apex, purplish brown, covered with a thick, sticky, hoary secretion, apex deeply v-notched, yellow, the lobes 1–2 mm long, apical margin thickened; *post-anther lobe extension* 1.4–1.8 mm; *auxiliary lobes* absent; *lateral lobes* converging, (1–)1.5–2 mm long, digitiform or laterally compressed, rather thick and fleshy, porrect to obliquely erect, each with a shaggy toothbrush-like arrangement of trichomes along upper edge, the individual trichomes 1.2–2.2 mm long, to c. 0.1 mm thick, embracing the apex of the post-anther lobe, coarse, yellow or cream (rarely white), often pink at base, at least the proximal trichomes connate at base. *Anther* inserted towards base of column, mostly obscured by stigma, broad-ovoid to subglobose, 2–2.5 mm long, 1.5–2 mm wide, the connective produced into an apical beak c. 0.4 mm long; *pollinarium* 1.6–2.2 mm long; *viscidium* more or less circular, c. 0.5 mm diam.; *pollinia* friable, mealy, white. *Stigma* situated at base of column, more or less quadrate, c. 2 mm long, c. 2 mm wide, margins irregular. *Capsules* obovoid, 9–15 mm long, 4–6 mm wide, erect, ribbed. (Fig. 7 a–c; Plate 3, Fig. 34)

Selected specimens examined: Western Australia: Lake Unicup area, 19 x. 1984, *R.J. Bates 4532* (MEL *725414*); Cape Le Grande road, 5 km E of Esperance, 6 x. 1981, *C. Lloyd 36* (MEL *604083*); Tone Bridge, 22 x. 1990, *R.J. Bates 24447* (MEL *725415*); Upper King River near Albany, x. 1946, *W.H. Nicholls s.n.* (MEL *1532688*); Youngs Siding, 26 x. 1932, *Rica Erickson s.n.* (PERTH *281557*); Swamp at Bartram Rd, Jandacot, 23 x. 1960, *A.S. George 1678* (PERTH *281565*); Caves Road, 9.8 km S of Moses Rock Rd, 1.7 km N of Cowramup Bay Rd, 21 x. 2000, *J.A. Jeanes 865 & C.J. French* (MEL *2093580*, MEL *2093581* & PERTH). South Australia: Kangaroo Island: Flinders Chase, 2 xi. 1986, *R.J. Bates s.n.* (AD *99112094*); Kangaroo Island: Peat bog 1 km E of Ravine De Casoars along Playford Highway, 2 xi. 1986, *R.J. Bates 7474* (AD *98650303*); Kangaroo Island: 9 km NW of Vivonne Bay, 9 xi. 1989, *R. Barratt & D.N. Kraehenbuehl 222* (AD *99116293*); Southeast Region: Big Heath, 6 xi. 1965, *D. Hunt 2590* (AD *98620068*). Victoria: Five Mile Rd, c. 1.5 km E of Tidal River Rd, Wilsons Promontory, 19 xi. 1979, *J. Eichler s.n.* (MEL *1546644*); 15 km WNW of Heywood P.O. c. 30 km NNW of Portland P.O., 28 xi. 1976, *A.C. Beauglehole 55327* (MEL *652736*); Heath Rd, Kentbruck, 14 xi. 1983, *C. & D. Woolcock 1360* (MEL *654677*); Anglesea, 30 xi. 1969, *G.W. Carr s.n.* (MEL *2039692*); Syphon Road swamp, Grampians, 12 xi. 1985, *R.J. Bates 6520* (AD *98551084*).

Distribution and habitat: Western Australia, South Australia and Victoria (and possibly Tasmania) (Fig. 35). Grows in moist depressions and around swamp margins under dense scrubland, heathy woodland or heathland on peaty sands that remain moist for most of the year. Altitude: 0–50 m.

Conservation status: Common and widespread and well conserved in Western Australia, but rare and seldom collected in the eastern states.

Flowering period: August to December.

Pollination biology: This species is facultatively autogamous and often also cleistogamous.

Typification: The type sheet contains five specimens and appears to consist of two separate collections. The three specimens on the left (α, β & γ) are small, slender and at the peak of their flowering, with one flower pressed in a semi-open position and readily identifiable. These specimens agree well with the protologue and with Fitzgerald's illustration (Fitzgerald 1875–95) of *T. nucida*, and have been designated as the lectotype by A.S.George (1971). The two specimens on the right are larger and in advanced fruit, but appear to be of the same taxon collected later in the season.

Notes: *Thelymitra nucida* is one of only three *Thelymitra* taxa that have a glaucous or shiny bloom on the post-anther lobe, the others being *Thelymitra inflata* Jeanes and *Thelymitra lucida* Jeanes from southeastern Australia (see below). *Thelymitra nucida* can be distinguished from these and from all other taxa by a combination of characters. The

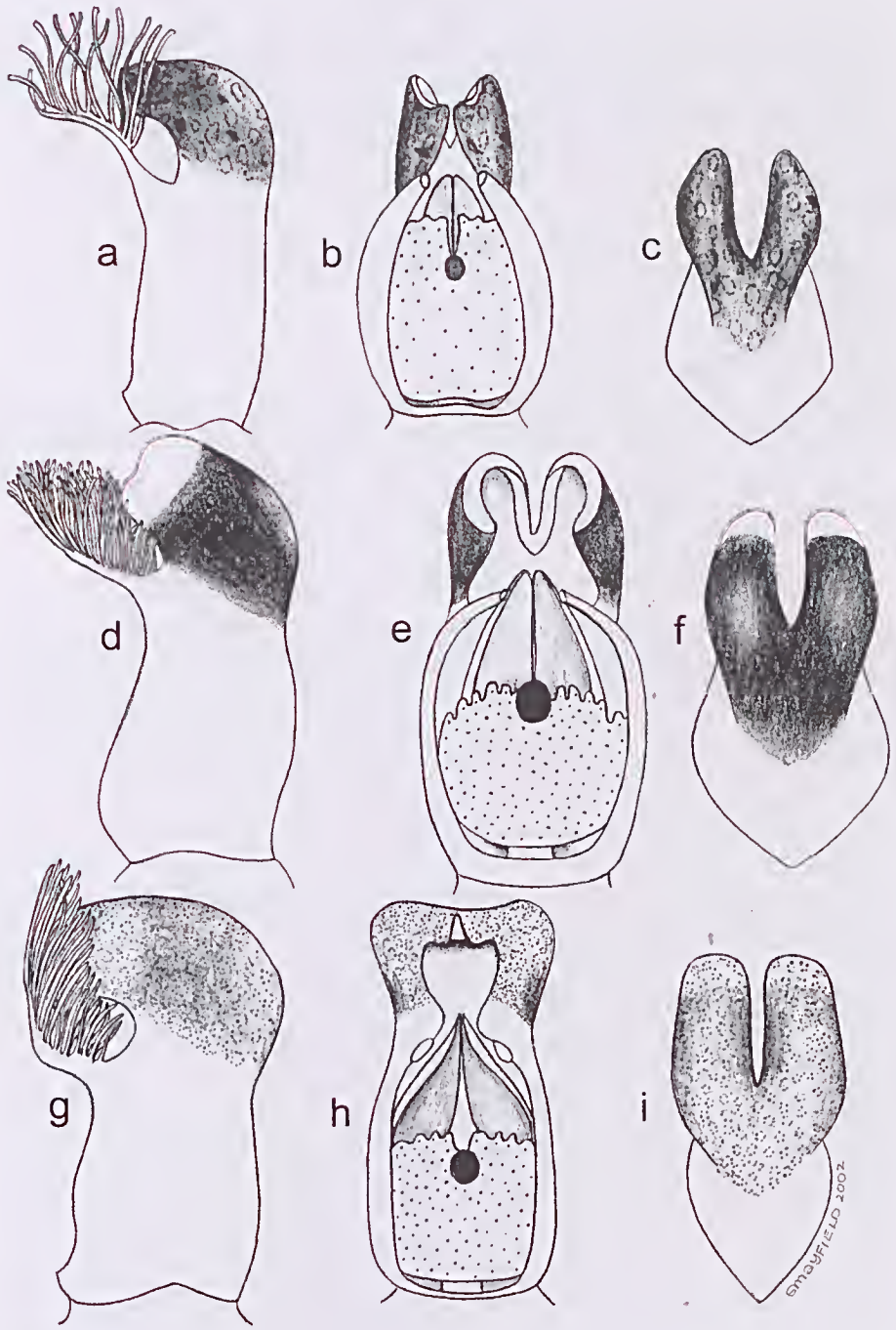

Figure 7.
Thelymitra mucida: **a** column from side X 10; **b** column from front X 10; **c** post-anther lobe from rear X 10
Thelymitra lucida: **d** column from side X 10; **e** column from front X 10; **f** post-anther lobe from rear X 10
Thelymitra inflata: **g** column from side X 10; **h** column from front X 10; **i** post-anther lobe from rear X 10

flowers are pale to dark blue or purplish, usually with strong pink colourations. The post-anther lobe is more or less cuneate, being quite narrow at the base and then widening abruptly above, and is at its widest near the apex where it is deeply v-notched. The bloom on the post-anther lobe is a copious thick, sticky, hoary secretion. The trichomes on the lateral lobes are bright yellow, few, sparse, relatively thick, long and of an untidy appearance and at least the proximal ones are usually fused together at the base. The anther in *T. mucida* is situated more or less at the base of the column and mostly obscured behind the stigma.

The occurrence of *T. mucida* in Tasmania is rather doubtful and in need of confirmation, being based on a single, poorly preserved, fragmentary specimen from Bruny Island.

20. *Thelymitra lucida* Jeanes, *sp. nov.*

Thelymitra holmesii Nicholls affinis sed lobo post-antheram columnae rorido nitido, trichomatibus in lobis lateralibus densioribus brevioribus albeis vel cremeo-luteis differt.

Type: Victoria. Brisbane Ranges, Durdidwarrah. Leveretts Road, c. 1 km W of Stony Creek Road. At the southern end of a sedge swamp just south of the road, 27 xi. 1989, *J. Eichler 118* (holotype MEL; isotype MEL).

Illustration: Jeanes & Backhouse (2001) page 173 (as *Thelymitra* sp. aff. *holmesii* 1).

Glabrous terrestrial *herb*. *Tubers* not seen. *Leaf* linear to linear-lanceolate, 20–35 cm long, 5–12 mm wide, erect, fleshy, canaliculate, ribbed abaxially, dark green with a purplish base, sheathing at base, apex acute. *Inflorescence* 30–55 cm tall, 1–3.5 mm diam., straight, green to purplish. *Sterile bracts* usually 2, occasionally 3, linear to linear-lanceolate, 1.3–7 cm long, 3–9 mm wide, closely sheathing, acute to acuminate, green to purplish. *Fertile bracts* ovate-acuminate to obovate-acuminate, 8–20 mm long, 4–8 mm wide, sheathing the pedicels, green to purplish. *Pedicels* 6–13 mm long, slender. *Ovary* narrow-obovoid, 6–10 mm long, 2–3.5 mm wide. *Flowers* 1–7, 16–24 mm diameter, dark blue, the petals and labellum often darker than the sepals, opening only on hot days. *Perianth segments* 8–12 mm long, 4–7 mm wide, concave, often shortly apiculate; *dorsal sepal* ovate, acute; *lateral sepals* ovate to lanceolate, slightly asymmetric, acute; *petals* ovate, acute or obtuse; *labellum* narrow-ovate to lanceolate, acute, only slightly smaller than other segments. *Column* erect from the end of ovary, 5–6 mm long, 2.5–3.5 mm wide, blue to pinkish; *post-anther lobe* hooding the anther, 2.5–4 mm long, 2–2.7 mm wide, tubular, compressed dorsally, inflated, gently curved, dark purplish black with a thin glistening bloom on the dorsal surface, margins thickened, apex deeply bilobed, yellow, lobes 1.2–1.6 mm long; *post-anther lobe extension* 0.8–1.5 mm; *auxiliary lobes* absent; *lateral lobes* converging, 1–1.5 mm long, digitiform, fleshy, porrect, more or less straight, each with a toothbrush-like arrangement of white or creamy yellow trichomes along virtually their entire length, the individual trichomes 1–1.2 mm long, c. 0.04mm thick. *Anther* inserted c. mid-way along column, partly obscured behind stigma, ovoid, 2–2.7 mm long, 1.5–2 mm wide, the connective produced into a blunt, apical beak 0.3–0.5 mm long; *pollinarium* 1.5–2.2 mm long; *viscidium* more or less circular, c. 0.5 mm diam.; *pollinia* friable, mealy, white. *Stigma* situated at base of column, ovate-quadrate, 1.5–2.5 mm long, 1.8–2.5 mm wide, margins irregular. *Capsules* obovoid, 10–15 mm long, 4–6 mm wide, erect, ribbed. (Fig. 7 d–f; Plate 4. Fig. 36)

Selected specimens examined: Victoria: Grampians. Glenelg River Rd 1.1 km from intersection of Woohlpooer Rd & Old Billywing Track, 10 xi. 2000, *A. Tindall 37 & B. Tindall* (MEL *2136723*). Tasmania: Huon Highway, Crabtree turnoff, 3 xi. 2001, *J.A. Jeanes 1194, L. Rubenach, H. & A. Wapstra* (MEL *2136745*, MEL *2136746* & HO).

Distribution and habitat: Recorded reliably only for Victoria and Tasmania. In Victoria

it is found in the Grampians and Midlands Natural Regions (Conn 1993) and in Tasmania in the Huon area south of Hobart (Fig. 38). Grows in or near sedge swamps on moist sandy or peaty soils, sometimes in standing water at flowering time. Altitude: 10–200 m.

Conservation status: Reasonably widespread and represented in reserves but extremely rare and seldom collected. Suggest 3EC by criteria of Briggs & Leigh (1996).

Flowering period: November and December.

Pollination biology: This species is facultatively autogamous.

Notes: *Thelymitra lucida* has been confused with *T. mucida*, but in the latter the post-anther lobe is widest towards the apex and the lateral lobes have fewer, sparser, generally thicker, longer, more untidily arranged, often basally connate, bright yellow trichomes that hug the tip of the post-anther lobe. The bloom on the post-anther lobe is a rather thin, glistening layer in *T. lucida* but is a copious thick, sticky, hoary secretion in *T. mucida*. *Thelymitra inflata* is immediately distinguished from *T. lucida* (at least in the fresh state) by its more inflated and more deeply cleft post-anther lobe. The former also often flowers earlier and grows in drier habitats.

Etymology: From the Latin *lucidus*, bright, glittering; in reference to the glistening bloom on the post-anther lobe of the column.

21. ***Thelymitra inflata*** Jeanes, *sp. nov.*

Thelymitra mucidae Fitzg. affinis sed lobo post-antheram columnae inflatiori ad medium latissimum, ad apicem incisum profundiorem angustiorem, trichomatibus in lobis lateralibus pluribus angustioribus brevioribus generatim albeis vel cremeo-luteis ad basin connatis nunquam differt.

Type: South Australia: Southern Lofty Region. Mylor township common, 31 x. 2001, *R.J. Bates 60152* (holotype AD; isotypes MEL, CANB).

Illustrations: Bates & Weber (1990) Plate 217; Jones *et al.* (1999) page 261 (both as *T. mucida*).

Glabrous terrestrial *herb*. *Tubers* ovoid, 1–3 cm long, 5–12 mm wide, fleshy. *Leaf* linear, 13–30 cm long, 4–10 mm wide, erect, fleshy, canaliculate, ribbed abaxially, dark green with a purplish base, sheathing at base, apex acute. *Inflorescence* 20–40(–65) cm tall, 1.3–3 mm diam., straight, green to purplish. *Sterile bracts* usually 2, linear-lanceolate, 1.5–7 cm long, 3–7 mm wide, closely sheathing, acute to acuminate, green to purplish. *Fertile bracts* ovate-acuminate to obovate-acuminate, 6–17 mm long, 4.5–8 mm wide, sheathing the pedicels, green to purplish. *Pedicels* 1–16 mm long, slender. *Ovary* narrow-obovoid, 3–12 mm long, 2–4 mm wide. *Flowers* 1–6, 16–27 mm diameter, dark blue to purplish, opening only on warm to hot days. *Perianth segments* 6–13 mm long, 4–8 mm wide, concave, often shortly apiculate; *dorsal sepal* ovate, obtuse to subacute; *lateral sepals* ovate to lanceolate, slightly asymmetric, acute; *petals* ovate, obtuse to subacute; *labellum* narrow-ovate to lanceolate, subacute, only slightly smaller than other segments. *Column* erect from the end of ovary, 5–6 mm long, 2.5–3.5 mm wide, blue to pinkish; *post-anther lobe* hooding the anther, 3–4 mm long, 1.9–2.6 mm wide, tubular, very inflated, projecting at c. 90° to basal part of column, pinkish brown, brown or less often black, with a narrow purplish collar, usually covered with a waxy, often glistening bloom, margins thickened and incurved, apex deeply split into 2 more or less parallel lobes 1.5–2.5 mm long, grading to yellow; *post-anther lobe extension* 1.2–1.6 mm; *auxiliary lobes* absent; *lateral lobes* converging, 1.5–2 mm long, c. 0.5 mm thick at the base, digitiform, fleshy, porrect in basal half, distal half projecting upwards at c. 45°, each with a toothbrush-like arrangement of white, cream or yellow trichomes along virtually their entire length, the individual trichomes 1.2–1.6 mm long, c. 0.04 mm thick. *Anther*

inserted towards base of column, mostly obscured behind stigma, ovoid, 2.5–3 mm long, 1.5–2 mm wide, the connective produced into a blunt, apical beak 0.4–0.8 mm long; *pollinarium* 1.9–2.5 mm long; *viscidium* more or less circular, c. 0.5 mm diam.; *pollinia* friable, mealy, white. *Stigma* situated at base of column, ovate-quadrate, 1.5–2.5 mm long, 1.8–2.2 mm wide, margins irregular. *Capsules* obovoid, 10–15 mm long, 4–6 mm wide, erect, ribbed. (Fig. 7 g–i; Plate 4, Fig. 37)

Specimens examined: South Australia: Southern Lofty: Mt Bold Rd adjacent Scott Creek C.P., 28 x. 1988, *R.J. Bates 15802* (MEL *725413* & CANB *484781*); Bugle Ranges, 28 x. 1917, *R.S. Rogers s.n.* (MEL *725416*, AD *97726267* & CANB *484789*); Southern Lofty region: National Park, Belair, 21 x. 1911, *R.S. Rogers s.n.* (MEL *725417*, AD *97708763* & CANB *484771*); Southeast: Marses Swamp, 2 xi. 1981, *R.J. Bates 1040* (AD *98152343*); Mylor, Mt Lofty, 23 x. 1977, *R.J. Bates s.n.* (AD *RJB*); Southern Lofty. Peters Creek near Kuitpo, xi. 1979, *R.J. Bates 546* (AD *RJB546*); Southern Lofty. Cleland Conservation Park, 7 xi. 1983, *R.J. Bates 3534* (AD *98402136*); Adelaide Gully Road via Millbrook, 18 x. 2001, *R.J. Bates JAJ1070* (MEL *2136732*); Southeast District, Along tracks in Scott Creek Conservation Park, 18 x. 1998, *R.J. Bates 51301* (CANB *609396*). Victoria: 9 miles NNW of Dergholm P.O., 29 xi. 1971, *A.C. Beauglehole 37986* (MEL *652670* & CANB *8505278*); Black Waterhole Education Area, 30 xi. 1983, *A.C. Beauglehole 75478* (MEL *1531703*); 10.5 miles WNW of Casterton P.O., 17 xi. 1971, *A.C. Beauglehole 37915* (MEL *652735* & MEL *2039598*); 8 miles NNE of Dartmoor, 10 miles W of Digby, S of Weecurra Road, 19 i. 1972, *A.C. Beauglehole 38160* (MEL *652443*); Western Plains: 28.7 km W of the railway line crossing in Portland via main Portland to Nelson Road, 2 xi. 1981, *M.A. Clements 2407* (CANB *811963*); 20 km WSW of Casterton in Drajurk State Forest, 4 xi. 2001, *D. Rouse JAJ1115* (MEL *2136742* & MEL *2136742*); Woohlpooer Road, NE of Woohlpooer, 15 xi. 2000, *D.L. Jones 17676 & K.J. FitzGerald* (CANB *631075*). Tasmania: Ridgeway Park, near Mount Wellington, 16 xii. 1992, *M. Wapstra DLJ11008* (CANB *605294*); Leslie Hill, near Longley, 20 xi. 1991, *A. Moscal 21960* (HO *142369*).

Distribution and habitat: South Australia, Victoria and Tasmania. In South Australia recorded for Kangaroo Island, Northern and Southern Lofty Regions and the Southeast Region, in Victoria for the Wannon Natural Region (Conn 1993) and in Tasmania for two sites near Hobart (Fig. 38). It usually grows in dry to moist woodlands and open forests, often in disturbed, winter-wet sites on clay loam soils. Altitude: 10–350 m.

Conservation status: Widespread, sometimes locally common and represented in reserves. Suggest 3RC by criteria of Briggs & Leigh (1996). Probably vulnerable or endangered in Victoria and Tasmania, where seldom collected.

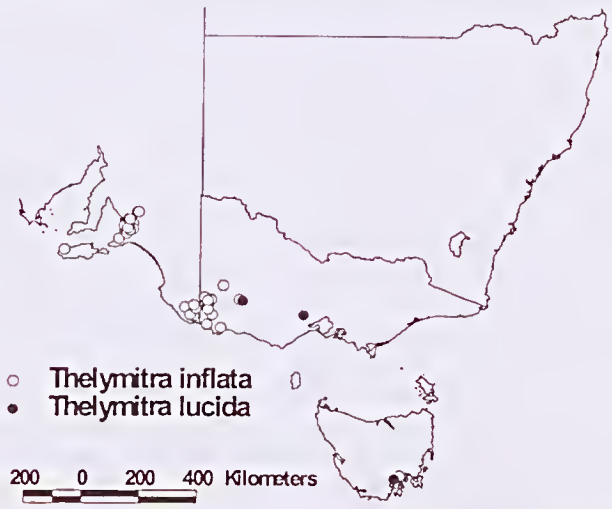

Figure 38. Distribution of *Thelymitra inflata* and *Thelymitra lucida*.

Flowering period: Late September to early December.

Pollination biology: This species is facultatively autogamous.

Notes: *Thelymitra inflata* has been confused with *T. nuda*, but the post-anther lobe of the latter is narrowest at the base and widest towards the apex and is broadly v-notched at the apex. The lateral lobes of *T. nuda* have fewer, sparser, generally thicker, longer, more untidily arranged, bright yellow trichomes that are often connate at the base and hug the tip of the post-anther lobe. *Thelymitra inflata* is also similar to *T. lucida*, but the latter usually grows in wetter habitats, often flowers later, has a less inflated post-anther lobe that is not as deeply notched at the apex and is covered with a much less obvious sparkling bloom and the lateral lobes are generally shorter and have shorter, white or creamy yellow trichomes.

Thelymitra inflata apparently hybridizes with *Thelymitra antennifera*, *Thelymitra juncifolia* and *Thelymitra rubra* in South Australia (R.J. Bates pers. comm.).

Etymology: From the Latin *inflata*, puffed up, inflated; in reference to the very inflated post-anther lobe on the column.

22. *Thelymitra holmesii* Nicholls, *Victorian Naturalist* 49: 263, f. (1933).

Type: Victoria: Gorae (via Portland), xii. 1932, *M. Holmes s.n.* (lectotype MEL *625480!, hic designatus;* isolectotypes MEL!; syntypes MEL!, AD).

Thelymitra pauciflora R.Br. var. *holmesii* (Nicholls) Nicholls, *Victorian Naturalist* 60: 56 (1943).

Illustrations: Nicholls (1933) page 262; Nicholls (1969) Plate 22, figs m & n (as *T. pauciflora* var. *holmesii*); Jeanes & Backhouse (2001) page 173.

Glabrous terrestrial *herb*. *Tubers* ovoid, 1–3 cm long, 5–12 mm wide, fleshy. *Leaf* linear, (7–)15–35 cm long, 3–10 mm wide, erect, fleshy, canaliculate, ribbed abaxially, dark or light green with a purplish base, sheathing at base, apex acute to acuminate. *Inflorescence* 18–75 cm tall, 1–2.6 mm diam., slender, straight, green to purplish. *Sterile bracts* usually 2, rarely 3, linear to linear-lanceolate, 1–7 cm long, 3–8 mm wide, closely sheathing, acute to acuminate, green to purplish. *Fertile bracts* ovate-acuminate to obovate-acuminate, 5–17 mm long, 3–8 mm wide, sheathing the pedicels, acute to acuminate, green to purplish. *Pedicels* 1–12 mm long, slender. *Ovary* narrow-obovoid, 8–12 mm long, 2–4 mm wide. *Flowers* 1–9, (12–)16–22(–30) mm diameter, usually deep purplish blue or mauve, opening reasonably freely on hot days. *Perianth segments* (6–)8–11(–15) mm long, 3.5–8 mm wide, concave, often shortly apiculate; *dorsal sepal* ovate, obtuse to subacute; *lateral sepals* lanceolate to ovate, often slightly asymmetric, acute; *petals* ovate, obtuse to subacute; *labellum* ovate to lanceolate, acute, often slightly smaller than other segments. *Column* erect from the end of ovary, 4.5–6.5 mm long, 2.5–3.5 mm wide, pale to dark mauve or pink; *post-anther lobe* hooding the anther, 2.5–3.5 mm long, 1.5–2.5 mm wide, tubular, compressed dorsally, inflated, curving through c. 90°, usually dark purple to almost black, apex deeply bilobed, yellow, lobes 1–1.5 mm long, parallel or divergent; *post-anther lobe extension* 0.8–1.2 mm; *auxiliary lobes* absent or sometimes present as 2 minute bumps on the lower apical margin of the post-anther lobe; *lateral lobes* converging to more or less parallel, 1–1.5 mm long, digitiform, porrect at base, curving gently upwards, each with a sparse, toothbrush-like arrangement of trichomes along most of their length, the individual trichomes 1.2–1.8 mm long, usually cream or yellow (some basal ones often pink), loose and shaggy, embracing apex of post-anther lobe. *Anther* inserted near centre of column, partly obscured behind stigma, ovoid, 2–3 mm long, 1.4–2.2 mm wide, the connective produced into an apical beak 0.5–0.8 mm long; *pollinarium* 1.6–2.4 mm long; *viscidium* more or less circular, 0.3–0.6 mm diam.; *pollinia* mealy, friable, white. *Stigma* situated at base of column, ovate-quadrate, 1.5–2.5

mm long, 1.3–2.2 mm wide, margins irregular. *Capsules* obovoid, 8–15 mm long, 4–7 mm wide, erect, ribbed. (Fig. 8 a–c; Plate 4. Fig. 39)

Selected specimens examined: South Australia: Honans Scrub area via Glencoe, 20 xi. 1988, *R.J. Bates s.n.* (MEL *725412* & CANB *484785*); S of Glenroy Conservation Park, 18 xi. 1989, *R.J. Bates 21543* (AD *98949166*); Southeast Region: Marshes Swamp, xi. 1991, *R.J. Bates 26823* (AD *RJB26823*); Mylor, Boyles Swamp, 20 xi. 1977, *R.J. Bates 4052* (AD *97807174*); Southeast Region: Big Heath, 5 xi. 1965, *D. Hunt 2590* (AD *966060970*); Kangaroo Island: Western end, xi. 1993, *R. Cox s.n.* (AD *99436243*); Southern Lofty: Mylor, 24 xi. 1976, *R.J. Bates s.n.* (AD *RJBSL*); Southern Lofty: Near Tooperang, 30 xi. 2000, *R.J. Bates 57807* (MEL *2100143*); Northern Lofty: Hughes Park via Sevenhill, x. 2000, *R.J. Bates 57688* (MEL *2100140*); Southern Lofty: Adelaide Gully, via Kersbrook, 20 x. 2000, *R.J. Bates 57689* (MEL *2100151*). New South Wales: Morton National Park, Bundanoon, i. 1970, *P. Moikrisz s.n.* (CANB *324385*). Victoria: Irrewillipe, 30 xi. 1994, *J.A. Jeanes 128* (MEL *2024472*); French Island, 4 xi. 1987, *C. Gordes 24* (MEL *1581003*); Wrights Swamp Road, 15 xi. 1986, *C.E. Woolcock s.n.* (MEL *2039702*); Darlimurla area, c. 500 m W of Darlimurla railway station beside old rail line, 8 xi. 2000, *J.A. Jeanes 937* (MEL *2087458*); Glenelg Shire, 9 miles NNW of Dergholm Post Office, main swamp in area, 29 xi. 1971, *A.C. Beauglehole 37987* (MEL *653452* & CANB *8505277*); Glenelg Shire, 10.5 miles WNW of Casterton Post Office, 17 xi. 1971, *A.C. Beauglehole 37916* (MEL *652728*); Wilsons Promontory National Park, 8 xi. 1983, *A.C. Beauglehole 75299* & *J.G. Eichler* (MEL *1531708*); 17.5 km NE of Yarram Post Office, 14 xii. 1978, *A.C. Beauglehole 62519* (MEL *640894*); Westernport Bay, East-central portion of Quail Island, 21 xi. 1952, *J.H. Willis s.n.* (MEL *221752*). Tasmania: Squeaking Point, Port Sorrel, 3 xii. 1998, *P. Tonelli ORG1975* (CANB *610398*); Black Rock Point, 3 km E of Stony Head, 26 xi. 1983, *A. Moscal 4515* (HO *409251*); Nunamara, quarry, 27 xi. 1961, *T.E. Burns 468* (HO *99414*); Knocklofty Park, Knocklofty, Hobart, 26 xi. 2000, *L. Rubenach JAJ794* (MEL *2136720*); Bridport, 31 x. 1987, *R.J. Bates 11409* (AD *RJB11409*); Police Point Rd near Police Point, 3 xi. 2001, *J.A. Jeanes 1193, L. Rubenach, H. & A. Wapstra* (MEL *2150701*, HO); Entrance to South Bruny National Park, South Bruny Island, 5 xi. 2001, *J.A. Jeanes 1208, L. Rubenach, H. & A. Wapstra* (MEL *2136739*, MEL *2136740* & HO); Airstrip, North Bruny Island, 5 xi. 2001, *J.A. Jeanes 1206, L. Rubenach, H. & A. Wapstra* (MEL *2136737*, MEL *2136738* & HO).

Distribution and habitat: South Australia, Victoria and Tasmania with a single outlying collection from Bundanoon, New South Wales (Fig. 42). Usually grows in and around swamps, in soaks or beside streams in open forest, woodland, heathy woodland or heathland, mostly on moist, water-retentive soils. Altitude: 0–200 m.

Conservation status: Widespread and well conserved, but rather uncommon.

Flowering period: Mostly November and December, rarely late October.

Pollination biology: This species is facultatively autogamous and sometimes also cleistogamous.

Typification: There are three herbarium sheets at MEL of plants collected by Murray Holmes in 1932 (two in December, and one in November of that year). The specimen that most closely resembles Nicholls' original illustration (Nicholls 1933) is specimen 'a' on MEL *625480*, and, since all three specimens on that sheet appear to be part of the same collection, this entire collection is here designated as the lectotype.

Notes: Plants consistent with Nicholls' description of *T. holmesii* and with the type specimens are relatively common in southeastern Australia. However, *T. holmesii* remains poorly known today due to the presence of several taxa that superficially resemble it. Several characters can be used in combination to define *T. holmesii sensu stricto*. It generally occurs at low elevations where it flowers primarily in November and December, and it usually prefers to grow in moist soils in seasonally inundated depressions and around swamp margins. The leaf is long, narrow and fleshy, rarely exceeding 10 mm wide, and the inflorescence is slender and up to 75 cm tall, usually with two sterile bracts. There are usually one to nine flowers that are autogamous (sometimes also cleistogamous) and will open freely only on very warm to hot days. The perianth segments are usually up to 11 mm long (but can be as long as 15 mm), and about half as

wide, purplish blue or mauve, or less often pink, in colour. The post-anther lobe is more or less tubular (almost closed on the ventral side), compressed dorsally, inflated, and extends to about 4 mm beyond the point of insertion of the anther and c. 1 mm beyond the point of insertion of the lateral lobes. The apex of the post-anther lobe is deeply bilobed with thickened margins. The lateral lobes are usually 1 to 1.5 mm long and are more or less straight or curve upwards gently. The trichomes on the lateral lobes are usually 1.2 to 1.8 mm long, cream or yellow in colour (proximal trichomes sometimes pinkish) and are arranged in sparse, untidy toothbrush-like tufts.

Thelymitra holmesii has been confused with *T. penicillata*, but the latter grows in drier habitats, generally flowers earlier and the lateral lobes have more or less terminal tufts of white trichomes.

Thelymitra pauciflora grows in drier habitats, flowers earlier, generally has fewer, paler flowers, a less inflated, entire or emarginate post-anther lobe and the lateral lobes have more or less terminal tufts of white trichomes.

23. *Thelymitra xanthotricha* Jeanes, *sp. nov.*

T. macrophyllae Lindl. affinis sed folio minori generatim, infloreseentia floribus paucioribus minoribus composita, trichomatibus in lobis lateralibus luteolis, lobo post-antheram inciso profundiori differt.

Type: Western Australia. Warradale Road, 3.5 km S of Brookton Highway, 20 x. 1998, *G. Brockman GBB452* (holotype PERTH).

Illustrations: Hoffman & Brown (1998) page 452 (as *Thelymitra* aff. *holmesii*) & page 453 (as *Thelymitra* aff. *pauciflora*).

Glabrous terrestrial *herb*. *Tubers* not seen. *Leaf* linear, 10–30 cm long, 5–10 mm wide, erect, fleshy, canaliculate, ribbed abaxially, dark green with a purplish base, sheathing at base, apex acuminate. *Inflorescence* 30–50 cm tall, 1.5–3 mm diam., straight, straw-coloured to purplish. *Sterile bracts* usually 2, linear to linear-lanceolate, 2–7 cm long, 4–8 mm wide, closely sheathing, green to purplish, acute to acuminate. *Fertile bracts* ovate-acuminate to obovate-acuminate, 5–25 mm long, 3–8 mm wide, green to purplish, sheathing the pedicels. *Pedicels* 2–15 mm long, slender. *Ovary* narrow-obovoid, 4–10 mm long, 2–3.5 mm wide. *Flowers* 1–6, (16–)25–30(–34) mm diameter, blue with indistinct darker longitudinal veins, opening only on warm to hot days. *Perianth segments* (8–)12–15(–17) mm long, 3–8 mm wide, concave, often shortly apiculate; *dorsal sepal* ovate to elliptic, obtuse to subacute; *lateral sepals* ovate to elliptic, often slightly asymmetric, acute; *petals* ovate to elliptic, obtuse to subacute; *labellum* elliptic to lanceolate, acute, often narrower than other segments; *column* erect from the end of ovary, 5–6.5 mm long, 2.5–3.5 mm wide, mostly pale blue; *post-anther lobe* hooding the anther, 2.5–3.5 mm long, 2–2.5 mm wide, tubular, inflated, gently curved through c. 90°, mostly dark brown, apex bilobed, yellow, lobes 0.8–1.5 mm long; *post-anther lobe extension* 1–1.5 mm; *auxiliary lobes* absent; *lateral lobes* converging, 1.5–2 mm long, digitiform, porrect at base then curving gently upwards, each with a very dense toothbrush-like arrangement of creamy yellow trichomes virtually along their entire length, the individual trichomes 1–1.5 mm long. *Anther* inserted c. mid-way along column, partially obscured behind stigma, ovoid, 3–3.8 mm long, 2–2.5 mm wide, the connective produced into an apical beak 0.7–1 mm long; *pollinarium* 2–3 mm long; *viscidium* more or less circular, c. 0.5 mm diam.; *pollinia* friable, mealy, white. *Stigma* situated at base of column, ovate-quadrate, 2–2.5 mm long, 1.8–2.5 mm wide, margins irregular. *Capsules* obovoid, 10–15 mm long, 4–6 mm wide, erect, ribbed. (Fig. 8 d–f; Plate 4. Fig. 41)

Selected specimens examined: Western Australia: Yarloop, ix. 1946, *W.H. Nicholls s.n.* (MEL *643663* & MEL *2039606*); Gosnells, 1 ix. 1946, *W.H. Nicholls s.n.* (MEL *1549092*, MEL

1549085, MEL *1549087* & MEL *2039774*); Tone River Bridge, 22 x. 1990, *R.J. Bates 24446* (AD *99111191*); Kwinana, 27 ix. 1984, *R.J. Bates 4284* (AD *98510274*); c. 1 km S of junction of Thomas Rd and Johnson Rd, E of Medina, 18 ix. 1977, *A.S. George 14904* (PERTH *279595* & PERTH *3114A*); Roe District: Just N of Gibson, 12 x. 1993, *D.L. Jones 12300* (CANB *9710266*); Dale Creek at crossing of the Brookton Hwy, 24 x. 2001, *G. Brockman JAJ1082* (MEL *2136728*); Stirling Road E of Forrestdale Lake, Forrestdale, 20 ix. 2001, *J.A. Jeanes 1149 & A.P. Brown* (MEL *2136743*, MEL *2136744* & PERTH); Darling District: 66.2 km along Muirs Highway from Manjimup to Mt Barker, 16 x. 1988, *D.L. Jones 3199* (CANB *8806861*).

Distribution and habitat: Endemic to southwestern Western Australia mostly in the Darling Ranges and the coastal plain between Perth and Bunbury, with isolated more southerly collections from the Manjimup and Esperance districts (Fig. 42). Grows in winter-wet areas along creek lines, flowering most prolifically after fire. Altitude: 10–350 m.

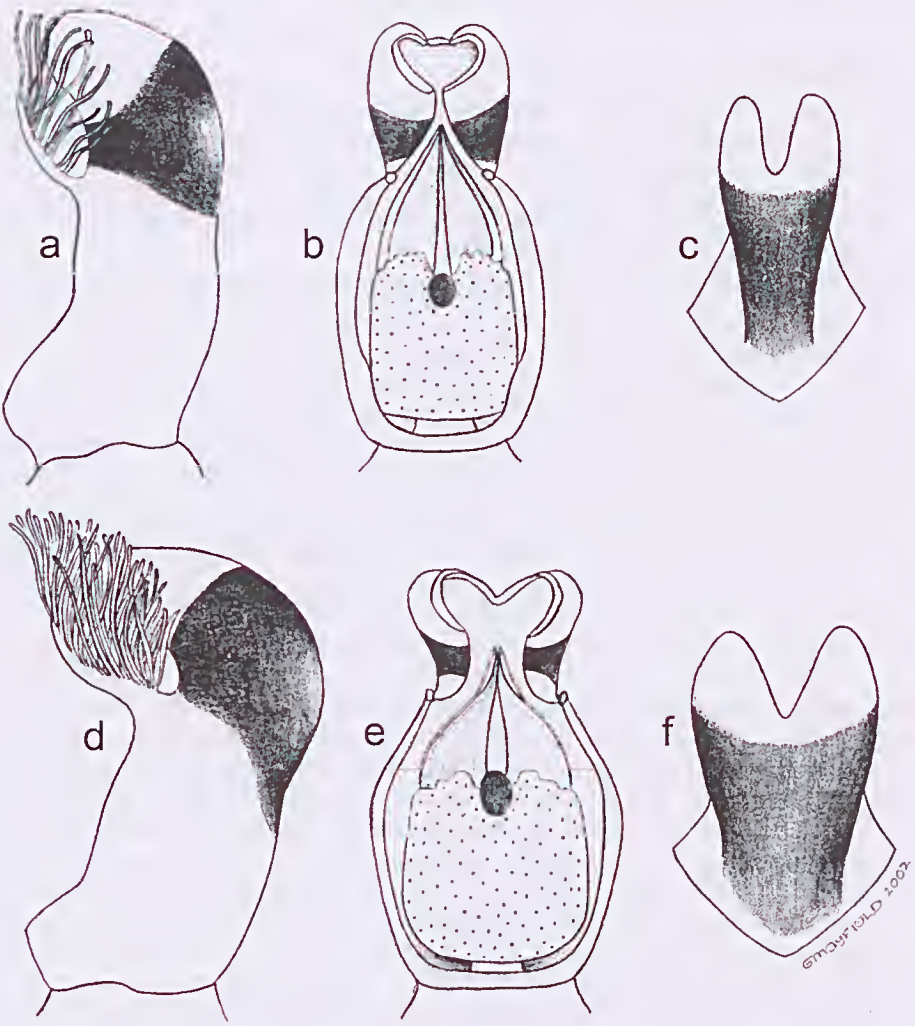

Figure 8.
Thelymitra holmesii: **a** column from side X 10; **b** column from front X 10; **c** post-anther lobe from rear X 10
Thelymitra xanthotricha:**d** column from side X 10; **e** column from front X 10; **f** post-anther lobe from rear X 10

Conservation status: Poorly known, but apparently extremely rare and seldom collected; suggest 3EC by criteria of Briggs & Leigh (1996).

Flowering period: September and October.

Pollination biology: This species is apparently facultatively autogamous.

Notes: *Thelymitra xanthotricha* is readily identified by its moderately large mid-blue flowers that have a prominently cleft post-anther lobe and dense creamy yellow trichomes along the entire length of the lateral lobes. *Thelymitra vulgaris* has generally smaller flowers with a more obviously v-notched post-anther lobe and white trichomes. *Thelymitra mucida* has generally smaller flowers with a more obviously v-notched post-anther lobe covered by a copious hoary bloom.

Thelymitra xanthotricha superficially resembles *Thelymitra macrophylla*, but the latter (a member of the *T. nuda* complex) is a generally more robust species with a much larger leaf, larger insect-pollinated flowers, less prominently cleft post-anther lobe and white trichomes on the lateral lobes.

The type locality of *T. xanthotricha* is an area rich in *Thelymitra* species including *T. graminea* and *T. mucida*, and the intermediate nature of its flowers suggests that *T. xanthotricha* may represent a stabilised hybrid between these two species.

Etymology: From the Greek *xanthos*, yellow; *trichos*, hair; in reference to the creamy yellow trichomes on the lateral lobes.

Acknowledgements

I am grateful to the Australian Biological Resources Study (ABRS) and the Australian Orchid Foundation (AOF) for their financial support of my work on *Thelymitra*, and to the Royal Botanic Gardens, Melbourne (MEL) for supplying me with a work area, access to technical equipment and library support. I wish to thank Kath Alcock, Barbara Archer, Gary Backhouse (DSE), Bob Bates, Cam Beardsell, Boris Branwhite, Gary Brockman, Andrew Brown (CALM), Mark Clements (CSIRO), Bruce Dalyell, Michael Duncan (DSE), Marco Duretto (HO), John Eichler, Tim Entwisle (NSW), Chris and Marie French, Wayne Gebert (MEL), Geoff Glare, Roger Hay, Cathy and Malcolm Houston, †Bill and Gloria Jackson, Sandra Jeanes, David (CSIRO) and Barbara Jones, Bill and Helen Kosky, Simon Lewis (MEL), Anne Looney, Margaret MacDonald, Steve Mueck (Biosis), David Munro, Allan and †Margaret Peisley, Andrew Pritchard (DSE), Jim Ross (MEL), Dean Rouse, Les Rubenach, James Todd (DSE), Peter Tonelli, Clive and Merle Trigg, Neville Walsh (MEL), Hans and Annie Wapstra, John Whinray, †Ron and Kath Williamson and Warren Worboys (RBGC) for supplying me with locality information, specimens and photographs, or for accommodation, transport, meals or companionship during field trips. My colleague Neville Walsh also kindly wrote the Latin diagnoses for the new taxa, performed the English translations from the original Latin descriptions of Brown and Lindley and made helpful comments on the text. My appreciation also goes to Enid Mayfield (MEL) for executing the line drawings, Peter Neish (MEL) for help with production of the distribution maps and the directors and curatorial staff at AD, BM, BRI, CANB, E, HO, MEL, NSW, P, PERTH, QRS and WELT for access to specimens.

Biosis = Biosis Research Pty Ltd (Vic.)
CALM = Department of Conservation and Land Management (W.A.)
CSIRO = CSIRO, Centre for Plant Biodiversity Research (A.C.T.)
DSE = Department of Sustainability and Environment (Vic.)
HO = National Herbarium, Hobart (Tas.)
MEL = National Herbarium, Melbourne (Vic.)
NSW = National Herbarium, Sydney (N.S.W.)
RBGC = Royal Botanic Gardens, Cranbourne (Vic.)

References

Backhouse, G.N. & Jeanes, J.A. (1995). *The Orchids of Victoria* (Melbourne University Press, Carlton).

Bates, R.J. (1999). 'Self Pollinated Sun Orchids of the *Thelymitra paniculata–T. longifolia* Alliance in Australia'. *The Orchadian*, 13(2): 65.

Bates, R.J. & Weber, J.Z. (1990). *Orchids of South Australia* (Government Printer, South Australia).

Bentham, G. (1873). *Flora Australiensis*, vol. 6. (L. Reeve & Co., London).

Bernhardt, P. (1993). *Thelymitra*, in 'Flora of New South Wales', vol. 4. ed. G.W. Harden (New South Wales University Press, Kensington).

Briggs, J.D. & Leigh, J.H. (1996). *Rare or Threatened Australian Plants*, Revised Edition. (CSIRO and Australian Nature Conservation Ageney, Canberra).

Brown, R. (1810). *Prodromus Florae Novae Hollandiae et Insulae van Diemen* (London).

Clements, M.A. (1989). Catalogue of Australian Orchidaeeae, *Australian Orchid Research* 1: 138.

Conn, B.J. (1993). *Natural Regions and Vegetation of Victoria*, in 'Flora of Vietoria', vol. 1. eds D.B. Foreman & N.G. Walsh. (Inkata Press, Melbourne).

Dockrill, A.W. (1992). *Australian Indigenous Orchids*. vol. 1. (Surrey Beatty & Sons Pty Ltd, Chipping Norton, NSW).

Fitzgerald, R.D. (1875–95). *Australian Orchids* vol. 1 & 2 (Government Printer, Sydney).

Fitzgerald, R.D. (1882). 'New Australian Orehids', *The Gardners' Chronicle*, new series, 17: 495.

George, A.S. (1971). 'A ehecklist of the orehids of Western Australia.' *Nuytsia* 1(2): 166–96.

Hallé, N. (1977). *Flore de la Nouvelle Caledonie et Dépendances 8: Orchidacées*. (Muséum National D'Histoire Naturelle, Laboratoire de Phanérogamie, Paris)

Hoffman, N. & Brown, A. (1998). *Orchids of South-west Australia*, edn 2 with supplement (University of Western Australia Press, Nedlands).

Jeanes, J.A. (2000). 'Two new speeies of *Thelymitra* (Orehidaeeae) from southeastern Australia', *Muelleria* 14: 91–97.

Jeanes, J.A. (2001). 'Two new species of *Thelymitra* (Orchidaceae) from southeastern Australia' errata, *Muelleria* 15: 95–96.

Jeanes, J.A. & Backhouse, G.N. (2001). *Wild Orchids of Victoria, Australia*. (Zooneties, Seaford).

Jones, D.L. (1988). *Native Orchids of Australia*. (Reed Books, Frenchs Forest).

Jones, D.L. & Clements M.A. (1988). 'New orchid taxa from southeastern Queensland', *Austrobaileya* 2(5): 550.

Jones, D.L. & Clements M.A. (1998a). 'Two New Speeies, Characterisation of Two Poorly Known Speeies and a New Name in *Thelymitra* J.R. & G.Forst. (Orchidaceae) from Australia', *Orchadian* 12(5): 326–33.

Jones, D.L. & Clements M.A. (1998b). Contributions to Tasmanian Orchidology–8: A Taxonomic Review of *Thelymitra* J.R. & G. Forst. in Tasmania, *Australian Orchid Research* 3: 178–203.

Jones, D., Wapstra, H., Tonelli, P. & Harris, S. (1999). *The Orchids of Tasmania* (Melbourne University Press, Carlton South).

Lindley, J. (1840a). *Edwards's Bot. Reg.* 1-23: Swan Riv. Append., 49.

Lindley, J. (1840b). *The Genera and Species of Orchidaceous Plants* (Ridgways, London).

Nicholls, W.H. (1933). 'A New Sun-orchid', *Victorian Naturalist*, 49: 262.

Nicholls, W.H. (1935). 'The Sun Orehids of Australia', *Orchidologia Zeylanica*, 2(4): 159.

Nicholls, W.H. (1969). *Orchids of Australia*, the complete edition (eds Jones, D.L. & Muir, T.B., 1969) (Thomas Nelson, Melbourne).

APPENDIX 1. INDEX

Bold page numbers are the main entries for accepted names. *Italic* page numbers are synonyms. Roman page numbers are for incidental mentions. Underlined page numbers are for illustrations. Double underlined page numbers are for maps.

Thelymitra albiflora 19, 24, 33, **38–40**, 37, 40
Thelymitra angustifolia 19, 20, 24, **52–56**, 53, 54, 59
Thelymitra antennifera 40, 73
Thelymitra arenaria 19, 20, 24, 44, 57, 59, **62–64**, 63
Thelymitra aristata 19, 58
Thelymitra atronitida 19, 20, 24, 34, 45, **46**, **47**, 50, 53
Thelymitra basaltica 19, 24, 30, 32, 33, **35**, **36**, 37
Thelymitra batesii 19, 25, 48, 59, **64–66**, 63
Thelymitra bracteata 19, 24, 34, 41, 42, **43**, **44**
Thelymitra brevifolia 19, 20, 23, 26, **30–35**, 32, 33, 65
Thelymitra cyanapicata 19, 24, 34, **40–43**, 41, 42
Thelymitra exigua 19, 24, 26, **28–30**, 28, 33, 36
Thelymitra fragrans 19
Thelymitra frenchii 19, 23, 48, 59, **66**, **67**, 67
Thelymitra graminea 19, 58, 62, 77
Thelymitra granitora 20, 66, 67
Thelymitra gregaria 20, 30
Thelymitra holmesii 19, 20, 23, 52, 60, 61, 70, **73–75**, 76
Thelymitra imbricata 20
Thelymitra inflata 19, 23, 60, 68, 69, **71–73**, 72
Thelymitra juncifolia 43, 73
Thelymitra longifolia 19, 20, 50, 56
Thelymitra lucida 19, 23, 60, 68, 69, **70**, **71**, 72, 73
Thelymitra ¥*macmillanii* 40
Thelymitra macrophylla 19, 62, 75, 77
Thelymitra malvina 19, 20, 24, 34, **47–50**, 48, 49
Thelymitra mucida 19, 20, 21, 23, 59, **67–70**, 67, 69, 71, 73, 77
Thelymitra nuda 19, 20, 44, 47, 64, 67, 77
Thelymitra pallidiflora 19, 24, 34, 42, **44–46**, 45
Thelymitra papuana 55
Thelymitra pauciflora 19, 20, 21, 22, **25–28**, 26, 28, 30, 32, 33, 36, 38, 40, 41, 44, 46, 58, 61, 64, 75
Thelymitra pauciflora var. *holmesii 73*
Thelymitra pauciflora var. *pallida 30, 32*
Thelymitra peniculata 19, 25, 34, 38, 47, 49, **50–52**, 53, 55, 64, 65, 75
Thelymitra plaaicola 20, 23, 54, **56–58**, 57, 59
Thelymitra rubra 43, 73
Thelymitra sarasiniana 55, 56
Thelymitra versicolor 19
Thelymitra viridis 19, 24, 33, **36–38**, 37, 40
Thelymitra vulgaris 19, 24, 57, **58–62**, 60, 61, 77
Thelymitra xanthotricha 19, 23, 60, 61, **75–77**, 76

Muelleria 19: 81–94 (2004)

A revision of *Bedfordia* DC. (Asteraceae)

A.E. (Tony) Orchard

Abstract

Variation and distribution of the three species of *Bedfordia* DC. are reviewed. Extensive hybridisation between *B. salicina* and *B. linearis* is noted. *B. linearis* is divided into two subspecies, *B. linearis* subsp. *linearis* and *B. linearis* subsp. *oblongifolia*. The latter is further divided into two varieties, var. *oblongifolia* and var. *curvifolia*. The relationship of *Bedfordia* to *Brachyglottis brunonis* is briefly discussed.

Introduction

The genus *Bedfordia* consists of 3 species, all aromatic shrubs or rarely small trees, found in south-eastern Australia from New South Wales to Tasmania. The Tasmanian species have the reputation of being very variable, and this study re-examines that variation, on the basis of field studies made in 1992 and earlier. These studies have shown that two of the Tasmanian species, *B. linearis* and *B. salicina*, currently overlap in distribution, particularly on the slopes of Mt Wellington, and form extensive hybrid swarms. In addition, *B. linearis* is shown to be far more complex in its variation than previously reported, and is here considered to comprise two subspecies, one of which is further subdivided into two varieties.

The first two species of what is now *Bedfordia* were described by Labillardière (1806), from Tasmanian collections. He described them as species within the broadly circumscribed genus *Cacalia* (*C. salicina* and *C. linearis*). De Candolle (1833, 1838) separated these two taxa as the distinct genus *Bedfordia*, on the basis of their shrubby habit, yellow florets, and entire, elongated, willow-like leaves which are cottony beneath, and this separation has been maintained ever since.

When further broad-leafed plants were discovered in southern New South Wales and Victoria, they were assigned uncritically to the Tasmanian species *B. salicina* (e.g. Bentham, 1867; Maiden & Betche, 1916; Ewart, 1931). Hooker (1856) had pointed out the close similarity of *Bedfordia* to *Senecio* "to which it is united by means of the species belonging to Forster's genus *Brachyglottis*; but as the intermediate forms are wanting in Australia, I have thought it more convenient to retain the genus for the present, its habit being very distinct from any of the Senecios of that country." Mueller (1858, 1882, 1888, 1889), perhaps influenced by this view but disagreeing with the conclusion, transferred *B. salicina* and *B. linearis* to *Senecio* as *Senecio bedfordii* F.Muell. and *S. billardierii* F.Muell. Bentham disagreed with Mueller, and pointed out that *Bedfordia* has axillary inflorescences, unknown in *Senecio*; he also thought (mistakenly) that *Bedfordia* had stellate hairs, also unknown in *Senecio*. Bentham thus retained *Bedfordia* as a distinct genus. Several later authors uncritically followed Bentham in ascribing stellate hairs to *Bedfordia*, and this myth was not finally dispelled until a paper by Willis (1967). Finally, Hochreutiner (1934) recognised that the mainland specimens represented a distinct species, *B. arborescens*. Hochreutiner's paper was largely overlooked in Australia until rediscovered by Gray (1974), but recent authors (e.g. Jeanes, 1999; Buchanan, 1999) agree on *Bedfordia* comprising three species *B. salicina*, *B. arborescens* and *B. linearis*.

In view of Hooker's recognition of the close relationship between *Bedfordia* and *Brachyglottis*, it is of interest to note that recent molecular studies are suggesting a close relationship between *Brachyglottis brunonis* (Hook.f.) B.Nord. (syn. *Senecio brunonis* (Hook.f.) J.H.Willis, *Centropappus brunonis* Hook.f., *Senecio centropappus* F.Muell. *nom. illeg.*), a narrowly endemic shrubby species of Mt Wellington and Mt Dromedary,

Tasmania, and the partially sympatric Tasmanian *Bedfordia* species (reported by S.J.Wagstaff & I.Breitwieser, *150 Years Conference*, Melbourne, 2003).

Brachyglottis brunonis differs from *Bedfordia* in a number of morphological characters, perhaps most notably in being essentially glabrous. It has hairs confined to a ciliate fringe on the capitular bracts, and thus lacks both the cottony/woolly hairs so characteristic of *Bedfordia* species (and which gives *B. arborescens* its common name of Blanket Bush), and the subsessile glandular hairs of the young stems and leaves which provide the resinous aroma of both fresh and dried material so characteristic of *Bedfordia*. Instead, *Brachyglottis brunonis* has copious dark embedded glands in the upper surface of its leaves, and these exude a resinous glossy coating to the upper leaf surface. These glands are absent on the lower surface and do not occur in *Bedfordia* species. The midrib of *Brachyglottis brunonis* leaves is embedded in the rather fleshy lamina, not deeply channelled above and prominent below, as in *Bedfordia*. The fleshy texture of the *Brachyglottis brunonis* leaves also means that they are smooth, lacking the deeply rugose texture of *Bedfordia* species. The capitula of *Brachyglottis brunonis* bear an outer whorl of ligulate female florets, whereas *Bedfordia* completely lacks ligulate florets, all of its florets being bisexual and tubular. In *Bedfordia* the barbs on the pappus bristles are uniform in length, whereas in *Brachyglottis brunonis* the barbs at the tip of the pappus bristles are distinctly longer, forming a very short 'brush'. In view of these morphological differences it seems premature at this stage to include *Brachyglottis brunonis* in the same genus as *Bedfordia*, although they are probably closely related. If it is found that *Brachyglottis brunonis* does not belong with other *Brachyglottis* species on molecular evidence, then a more satisfactory solution might be to return to Hooker's view, and treat it as a monotypic genus *Centropappus*, alongside *Bedfordia*.

Taxonomy

Bedfordia DC., in A.-J. Guillemin, *Arch. Bot.* 2: 332 (1833)

Type: Not designated. Based on *Cacalia salicina* Labill. and *C. linearis* Labill. Lectotype (here chosen): *Bedfordia salicina* (Labill.) DC. Named in honour of John Russel, Duke of Bedford, patron of horticulture and botany, *fide* A.P. de Candolle, *Prodromus* 6: 440 (1838); J.D.Hooker, *Flora Tasmaniae* 1: 224 (1856).

Trees or *small shrubs* 1–8 (rarely to 12) m tall, aromatic due to glandular hairs on young stems and leaves. *Leaves* alternate, exstipulate, tapering to base with a short or poorly-defined petiole; lamina laneeolate to oblanceolate, planar with well defined midrib and pinnate venation, or oblong to linear with margins revolute to midrib; midrib and secondary venation if present usually impressed above, prominent below, more or less glabrous above, with woolly or velvety indumentum at least on midrib below, and sometimes across entire abaxial surface. *Inflorescences* borne in axils of upper leaves, comprising irregular panicles of 10–40 capitula, or reduced to just a single capitulum. *Peduncles* and inflorescence branches white-woolly. *Capitular bracts* in 2 whorls, each whorl of 4 or 5, woolly on outer surface, all similar, but the inner ones with glabrous margins. *Florets* 9–17 per capitulum, all bisexual and tubular. *Pappus* of 40–60 free setae; setae denticulate for entire length with teeth of equal length, unthickened at tip, arranged in a single whorl which may be slightly fused at extreme base. *Corolla tube* cream to yellow or orange, swollen at base, slender in centre and campanulate towards tip; corolla lobes ligulate or strap-like. *Anther* tails short, narrower than thecae. *Styles* exserted, carrying anther tube with them. *Cypselas* cylindrical, with 10–14 longitudinal ribs.

A genus of 3 species, confined to south eastern Australia, from sealevel to about 1200 m. Two species are confined to Tasmania; the third is found mainly in south eastern New South Wales and eastern Victoria, but extends to Cape Barren Island in Bass Strait. All are understorey species, in communities ranging from wet tall open forest to dry selerophyll shrubland. Most seem to be pioneer species after fire or other disturbance.

Both *B. salicina* and *B. linearis* contain alkaloids (Biek *et al.*, (1991), perhaps pyrrolizidine alkaloids.

Key to the taxa of *Bedfordia*

1. Leaves lanceolate to narrowly ovate, more than 1 cm wide; inflorescences multiheaded in each leaf axil
   2. Undersurface of leaves with woolly hairs in 2 distinct layers, with hairs in outer layer arising from thickened bases and floccose ..... *B. arborescens*
   2: Undersurface of leaves with woolly hairs in a single layer; hairs without thickened bases, and closely appressed/matted ..... *B. salicina*
1: Leaves linear, usually less than 3 mm wide; inflorescences 1-headed in each leaf axil (rarely 3–5-headed in a few lower axils)..... [*B. linearis*]
   3. Leaves (10–) 15–20x as long as wide; leaf tip bluntly acute .... *B. linearis* subsp. *linearis*
   3: Leaves 3–10x as long as wide; leaf tip rounded...[*B. linearis* subsp. *oblongifolia*]
      4. Leaves 5–10x as long as wide, more or less straight; peduncles 5–7 mm long ..... *B. linearis* var. *oblongifolia*
      4: Leaves 3–5x as long as wide, with tip upwardly curved; peduncles 2–4 mm long..... *B. linearis* var. *curvifolia*

Bedfordia arborescens Hochr., *Candollea* 5: 332 (1934); G.R.Cochrane, B.A.Fuhrer, E.R.Rotherham & J.H.Willis, *Fl. Pl. Vict.* 144 (1968); A.M.Gray, *Muelleria* 3: 64–66 (1974); G.J.Harden, *Fl. NSW* 3: 298 (1992); N.G.Walsh & T.J.Entwisle, *Fl. Vict.* 4: 966 (1999).

Senecio bedfordii F.Muell., *Cat. Pl. Cult. Melbourne Bot. Gardens* 26 (1857); F.Mueller, *Syst. Census Austral. Pl.* 84 (1882); F.Mueller, *Key Syst. Vict. Pl.* 1: 340 (1888); F.Mueller, *Second Syst. Census Austral. Pl.* 142 (1889); C.Moore & E.Betche, *Hdbk Fl. NSW* 298 (1893), *nom. illeg.* (based on *Bedfordia salicina* (Labill.) DC., which itself is misapplied to the Victorian and New South Wales plants).

Bedfordia salicina auctt. mult., non (Labill.) DC.: G.Bentham, *Fl. Aust.* 3: 673 (1867), *p.p.*; J.H.Maiden & E.Betche, *Census NSW Pl.* 205 (1916); A.J.Ewart, *Fl. Vict.* 1178 (1931); J.H.Willis, *Muelleria* 1: 163 (1967); J.H.Willis, *Hdbk Pl. Vict.* 2: 756 (1972); N.T.Burbidge & M.Gray, *Fl. ACT* 375 (1976).

Type: *B.P.G.Hochreutiner 3046*, 26.ii.1905, Australia, Victoria, mts Blacksspurs, forêt d'*Eucalyptus* à sous-bois dense, alt. 600m., arbre de 8.m à fleurs jaunes. Holo: G, *n.v.*, photo. CANB!

Illustrations: G.R.Cochrane, B.A.Fuhrer, E.R.Rotherham & J.H.Willis, *Fl. Pl. Vict.* 144 (1968); N.T.Burbidge & M.Gray, *Fl. ACT* 377 (1976); N.G.Walsh & T.J.Entwisle, *Fl. Vict.* 4: 967, fig. 198a (1999).

Shrubs or *small trees* 5–8 (–12) m tall. Young *branches* with dense white-woolly indumentum. Older branches glabrescent; leaf scars slightly raised but not peg-like. *Leaf* lamina oblong to narrow-elliptic or lanceolate, 10–22 cm long, 2–5 cm wide, tapering abruptly to a slender petiole (1–) 2–3 cm long; tip blunt to rounded; margins flat, entire to crenate; upper surface dark glossy green, glabrous, with impressed veins; lower surface densely and thickly woolly tomentose throughout, with hairs in 2 distinct layers (outermost floccose), with veins largely obscured. *Inflorescence* an irregular panicle of (10–) 20–30 (–40) capitula in the axils of several of the upper leaves. *Peduncle* white-woolly, bearing reduced narrow bracts; pedicels similar, with or without bracts. *Capitular bracts* in 2 whorls usually of 4–5 each. Outer bracts broadly lanceolate, 4–6 mm long, 1–2 mm wide, slightly navicular, acute to blunt, entirely white-woolly but with no

terminal tuft of hairs. Inner bracts similar, but with more or less glabrous margins. *Florets* 10–14 per capitulum, all bisexual, tubular. *Pappus* of 40–60 free setae, denticulate for entire length, arranged in a single basally fused ring. *Corolla tube* yellow to orange, in 3 sections: basal swollen section 0.5–0.7 mm long, 0.8 mm diam.; central slender section 2.5–3.0 mm long, 0.5 mm diam.; terminal campanulate section 0.5 mm long, 0.8 mm diam., with 5 ligulate reflexed/curling corolla lobes 1.5 mm long. *Anther* tube yellow–orange, 1.0–1.7 mm long; anther tails short; anther appendages 0.4–0.5 mm long, narrower than or equalling the theeae. *Style* arms e. 1.0–1.2 mm long, thick, blunt, with very short antrorse hairs on abaxial surface. *Cypselas* cylindrical, 2.9–3.0 mm long, 0.6 mm diam., red-brown with 10 weakly paired vertical ribs.

Ecology: Most collections are described as coming from the shrub understorey of relatively wet tall open forest (e.g. *Eucalyptus fastigiata - E. cypellocarpa - E. elata* forest with understorey shrubs such as *Pomaderris aspera*, *Cyathea australis*, *Polystichum*, *Dicksonia*, *Atherosperma*, *Elaeocarpus* and *Olearia argophylla*) at altitudes of up to 1160 m. Flowering and fruiting from October to about February, with old capitula remaining on the plant for most of the year.

Distribution: Endemic to south eastern Australia; in the South Coast and Southern Tablelands regions of New South Wales; in Victoria in the Midlands, Otway Plain, Otway Range, Eastern Highlands, Gippsland, Gippsland Highlands, Wilson's Promontory, Snowfields, and East Gippsland region; and an outlier in Tasmania on Mt Munro, Cape Barren Island. *Figure 1A*.

Specimens examined (selection): NEW SOUTH WALES: *I.Crawford 1305*, 28.i.1991, Tantawangalo State Forest (CANB, MEL, NSW); *R.Pullen 3944*, 20.xi.1963, Brown Mountain, E of Nimmitabel (A, B, C, CANB, H, L, K, NSW, WELT); *A.J.Whalen 348, G.T.Chandler & S.Fethers*, 16.xii.1998, 4 km along Bemboka River Road (CBG, MEL, NSW). AUSTRALIAN CAPITAL TERRITORY: *R.Pullen 2534*, 10.i.1961, saddle to S of Mt Coree (A, AD, B, BH, BISH, BM, BRI, CANB, G, K, L, MEL, NSW, P, SING, Z); *M.M.Richardson 82, P.Ollereushaw & S.Walton*, 22.iv.1987, 7.5 km from Uriarra Road on Blue Range Road (CANB). VICTORIA: *E.M.Canning 1460*, 4.i.1969, 70.8 km from Corryong toward Omeo (CBG, L); *A.E.Orchard 6125*, 18.i.1991, 9 km from Apollo Bay along Great Ocean Road (HO); *R.Schodde 3185*, headwaters of Don River, Donna Buang Range (K); *R.V.Smith 73/37*, 21.xi.1975, Cudgewa Bluff (AD, BRI, HO, CANB, NSW). TASMANIA: *P.Collier 3598*, 7.x.1988, Mt Munro, Cape Barren Island (HO); *P.Cullen s.n.*, 15.iii.1990, Mt Munro, Cape Barren Island (HO).

Bedfordia salicina (Labill.) DC., *Prodr.* 6: 441 (1838); J.D.Hooker, *Fl. Tasman.* 1: 224 (1856); L.Rodway, *Tasman. Fl.* 92 (1903) *p.p.*; W.M.Curtis, *Student's Fl. Tasman.* 2: 371 *p.p.*; J.H.Willis, *Muelleria* 1: 163 (1967), *p.p.*; A.M.Gray, *Muelleria* 3: 64–66 (1974).

Cacalia salicina Labill., *Nov. Holl. Pl.* 2: 37, Tab. 179 (1806).

Culcitium salicina (Labill.) Spreng., *Syst. Veg.* 3: 431 (1826).

Type: J.J.H. de Labillardière, [SE Tasmania] Habitat in capite Van-Diemen, *n.v.* Possible isotype: "Cacalia salicina, ex herb. P.B.Webb" (no collector or locality), K.

Illustrations: J.J.H. de Labillardière, *Nov. Holl. Pl.* 2: Tab. 179 (1806); A.M.Gray, *Muelleria* 3: 66, fig. 30a (1974).

Shrubs or *small trees* to 2–5 (–7) m tall. Young *branches* with dense white-woolly indumentum. Older branches glabrescent, leaf scars flattened, peg-like. *Leaf* lamina oblanceolate, 6–13 cm long, 1.0–1.8 cm wide; tip acute to rounded; margins flat to slightly revolute, sometimes slightly undulate; upper surface dark glossy or dull green, glabrous, with midrib and secondary veins obvious and impressed; lower surface completely covered with a fine white-woolly indumentum in a single matted layer which does not obscure the prominent midrib and lateral veins; lamina tapering to a slender petiole 1.0–1.5 cm long; petiole widening abruptly at base. *Inflorescence* an irregular

Figure 1. Distribution maps. A. *Bedfordia arborescens*. B. *Bedfordia salicina*. C. *Bedfordia salicina* x *Bedfordia linearis*. D. *Bedfordia linearis* ssp. *linearis*.

panicle of (3–) 8–25 (–40) capitula in the axils of several upper leaves; sometimes with 2 or 3 panicles per axil. *Peduncle* white-woolly, bearing reduced leaf-like bracts; pedicels similar, slender, 2–5 mm long, also with 2–3 narrow white-woolly bracts. *Capitular bracts* in 2 whorls of usually 4 each. Outer bracts lanceolate, 4.3–5.0 (–5.8) mm long, 1.3 mm wide, slightly navicular, acute, slightly thickened at base, entirely white-woolly, with midrib darker, and with a terminal tuft of hairs. Inner bracts similar but slightly wider, 1.7–1.8 mm wide, with 1 or 2 subglabrous wing-like margins; tip blunt with a terminal hair tuft; wing margins ciliate near apex. *Florets* 10–15 per capitulum, all bisexual, tubular. *Pappus* of 40–60 free setae, denticulate for entire length; arranged in a single slightly lobed ring. *Corolla tube* yellow, in 3 sections: basal swollen section 0.5 mm long, 0.8 mm in diam.; central slender section 2.2 mm long, 0.5 mm diam.; terminal campanulate section 0.8 mm long, 0.8 mm diam., with 5 ligulate reflexed/curled corolla lobes 1.7 mm long. *Anther* tube pale brown, 1.0–1.7 mm long; anther tails short; anther appendages c. 0.4 mm long, linear, narrower than thecae. *Style* arms c. 1.0–1.2 mm long, thick, blunt, with very short antrorse hairs on abaxial surface. *Cypselas* cylindrical, 2.9 mm long, 0.7 mm diam., red-brown with 10 lighter coloured weakly paired vertical ribs.

Ecology: Most collections are described as coming from the shrubby understorey of dry sclerophyll forest, on dolerite soils, although there is considerable variation. Commonly associated species include *Eucalyptus obliqua*, *E. delegatensis*, *E. globulus*, *E. pulchella*, *Pomaderris apetala*, *Acacia dealbata*, *A. umcronata*, *Leptospermum lanigerum*, *Bursaria spinosa*, *Dodonaea viscosa*, *Olearia viscosa*, *Monotoca glauca*, *Blechnum wattsii* and *B. nudum*. Altitudinal range: sealevel to 1000 m. Flowering occurs from (September–) October–December with fruit remaining until about March. Old empty capitula remain on the plant year round.

Distribution: Endemic to mainland Tasmania: most frequent in the East Coast region, moderately common in the Central Highlands, and with occasional records from the North West, North East, Midlands, Ben Lomond, Mt Wellington and eastern part of the South West regions. *Figure 1B*.

Specimens examined (selection): NORTH WEST: *A.M.Buchanan 7527*, 28.xi.1985, Mersey River 0.2 km downstream from Alum Cliffs (HO). MIDLANDS: *A.M.Buchanan 13450*, 28.ix.1993, Clarence Point, West Tamar (HO); *A.Moscal 12737*, 14.iii.1986, Dale Brook, c. 13 km SSE of Mole Creek (HO). NORTH EAST: *A.M.Buchanan 4897*, 13.xii.1984, above Pipers River near Karoola (HO); *A.M.Buchanan 12371*, 25.v.1992, corner of Basin Creek Road and Old Coach Road (HO); *A.M.Buchanan 11278*, 30.xii.1988, head of Constable Creek (HO). BEN LOMOND: *M.J.Brown 801*, 13.iii.1985, Mt Albert (HO); *A.M.Buchanan 4516*, 15.xi.1984, Eton Road, Billy Taylor Bridge (HO); *A.M.Buchanan 7361*, 25.xi.1985, end of Cox 9, Tower Hill Plantation (HO). CENTRAL HIGHLANDS: *N.T.Burbidge 3316*, 24.i.1949, 8 km N of Tarraleah (HO); *A.M.Gray s.n.*, 25.v.1975, Tungatinah (HO); *A.Moscal 18328*, 5.i.1990, head of Garcias Creek, Catheart Bluff (HO). MT WELLINGTON: *D.Paton, J.Willis & R.Melville s.n.*, 15.xii.1952, Mt Wellington (HO). EAST COAST: *A.M.Buchanan 4823*, 11.xii.1984, Reynolds Hill (HO); *A.M.Buchanan 8337*, 29.iii.1986, Variety Bay, North Bruny Island (HO); *A.E.Orchard 5012*, 16.iv.1978, Forest Rd extension, Knocklofty (AK, BAA, HO, NSW). SOUTH WEST: *A.M.Buchanan 8357*, 30.iii.1986, Fluted Cape, South Bruny Island (HO).

Bedfordia salicina x Bedfordia linearis

Hybrids between *B. salicina* and *B. linearis* are common, especially on the slopes of Mt Wellington and vicinity, but several records are also known from the Central Highlands, and occasional specimens from the North East and Ben Lomond regions. *Figure 1C*. Well-developed hybrid swarms can be found with plants displaying all leaf shapes between *B. salicina* and *B. linearis*. Many of these plants have leaves with the shape of *B. linearis* (both subspecies), but the hairs of *B. salicina*. Inflorescence structure in these hybrid plants is intermediate between the two species, and usually consists of panicles of

2 or 3 capitula per axil. Occasional specimens set apparently normal seed, and the populations have the appearance of containing both F1 and backcross progeny.

Specimens examined (selection): NORTH EAST: *A.M.Buchanan 12420*, 7.vii.1992, Dismal Range (HO); *A.M.Buchanan 15437*, 3.ii.1999, NE ridge Mt Arthur (HO, CANB); *P.Collier 2623*, 28.viii.1987, Tippogoree Hills (HO). BEN LOMOND: *W.D.Jackson s.n.*, 23.ii.1983, Mt Barrow (HO); *A.V.Ratkowsky s.n.*, 12.i.1992, Mt Barrow (HO). CENTRAL HIGHLANDS: *A.M.Buchanan 2024*, 9.xii.1983, 14 Mile Road near Tarraleah (HO); 1 km NE of Howell's Bluff, Lake Rowallen (HO); *J.Wells s.n.*, 30.v.1984, Mags Road Bogs (HO). EAST COAST: *A.M.Buchanan 7688*, 29.xii.1985, Mt Peter (HO); *W.M.Curtis s.n.*, 15.ix.1942, Hobart, Proctor's Road (HO); *J.Milligan 1039*, 9.vii.1848, ravines between Mt Wellington and Knoeklofty, Hobart (HO); *A.E.Orchard 6246, 6247, 6248, 6249*, 1991, old quarry site, slopes of Mt Wellington (HO).

Bedfordia linearis (Labill.) DC. *Prodr.* 6: 441 (1838); J.D.Hooker, *Fl. Tasman.* 1: 225 (1856); L.Rodway, *Tasman. Fl.* 92 (1903); W.M.Curtis, *Student's Fl. Tasman.* 2: 371 (1963); M.Cameron, *Guide Fl. Pl. Tasman.* 44 (1981).

Cacalia linearis Labill., *Nov. Holl. Pl.* 2: 36, tab. 178 (1806).

Culcitium lineare (Labill.) Spreng., *Syst. Veg.* 3: 431 (1826).

Senecio billardierii F.Muell., *Cat. Pl. Cult. Melbourne Bot. Gardens* 26 (1858); F.Mueller, *Syst. Census Austral. Pl.* 84 (1882); F.Mueller, *Second Syst. Census Austral. Pl.* 142 (1889), *nom. illeg.* (based on *Bedfordia linearis* (Labill.) DC.)

Type: J.J.H. de Labillardière, [SE Tasmania] Habitat in capite Van-Diemen, *n.v.* Possible isotype: "Cacalia linearis, N. Holl." (no collector), K.

Illustrations: J.J.H. de Labillardière, *Nov. Holl. Pl.* 2: tab. 178 (1806); Cameron, *Guide Fl. Pl. Tasman.* fig. 83 (1981).

Shrubs 1–2 (–3) m tall. Young *branches* with dense white-woolly indumentum, becoming discoloured with age, at first with a yellowish resin, later with adherent dust; older branches glabrescent, with peg-like leaf scars. *Leaf* lamina linear to oblong or narrowly oblong, (6–) 10–90 mm long, to 3 mm wide, very shortly petiolate; upper leaf surface glabrous, glossy, with midrib impressed and other veins obscure. *Inflorescence* of a single capitulum in each of several upper leaf axils (very rarely with 3–5 in lower axils; upper axils always bearing only a single capitulum); *peduncle* 2–7 mm long, white-woolly, with 3 linear bracts. *Capitular bracts* in 2 whorls, with c. 4 bracts in each, all lanceolate but inner whorl generally broader; central region white-woolly; margins wing-like and subglabrous, usually with ciliate margins. Florets 9–17 per capitulum, all bisexual and tubular. *Pappus* of 40–60 free seta, denticulate for entire length. *Corolla tube* cream to yellow, swollen at base, slender in centre and campanulate at apex, with 5 strap-like lobes. *Anther* tube brown; anther tails short; anther appendages linear, 0.5 mm long, narrower than thecae. *Style* arms 1.3–1.6 mm long, thick, blunt, with short antrorse hairs on abaxial surface. *Cypsela* deep purplish-black, cylindrical, 2.5–3.3 mm long, 0.7–1 mm diam., with 10–14 vertical ribs; pappus persistent with basal pappus ring weakly 5-lobed.

Bedfordia linearis subsp. ***linearis***

Shrubs to 1.5–2.0 (–3.0) m tall. Young *branches* densely white-woolly; bark red-brown to grey-brown, vertically striate to stringy. *Leaf* lamina narrowly linear, (25–) 35–70 mm long, 1.5–2.0 (–2.5) mm wide, length:width ratio 15–20 (rarely only 10); tip bluntly acute, slightly reflexed; margin revolute. Lower leaf surface densely white-woolly with crisped hairs arising mainly from midrib, interlocking with similar hairs on the upper and lower surface of the thin reflexed margin; lamina either side of midrib more or less glabrous apart from scattered subsessile yellow glandular hairs; midrib with or without a longitudal subcuticular void on each side; petiole 1–2 mm long, persistent as a peg after leaf fall. *Peduncle* 4–6 mm long, white-woolly, with c. 3 linear bracts 2 mm long. *Capitular bracts* in 2 whorls of usually 4 each. Outer bracts narrowly lanceolate, 5.0–6.0

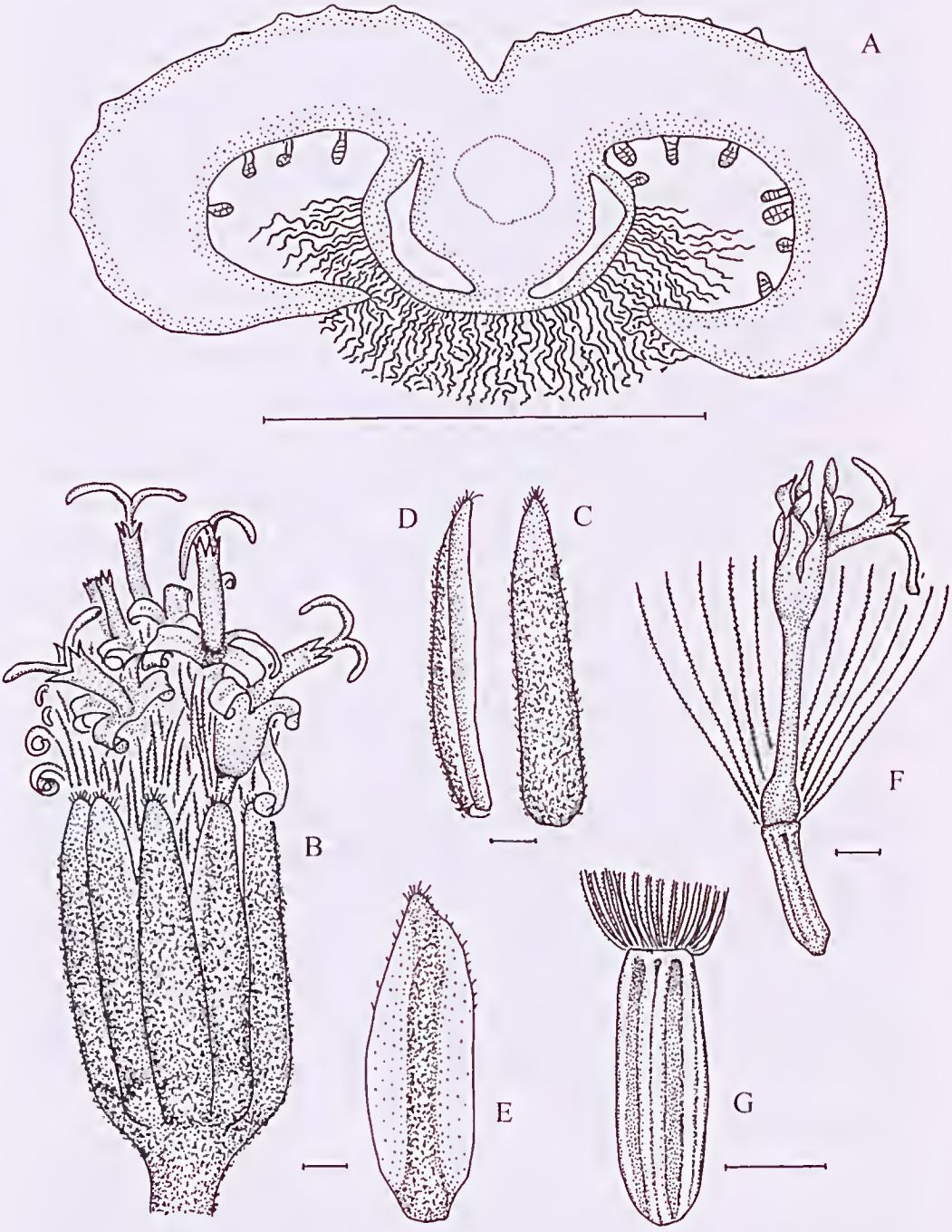

Figure 2. *Bedfordia linearis* subsp. *linearis*. **A.** Leaf cross section (semidiagramatic) – note voids alongside midrib. **B.** Capitulum. **C.** Outer capitular bract (dorsal view). **D.** Outer capitular bract (lateral view). **E.** Inner capitular bract (dorsal view). **F.** Floret (some pappus bristles removed). **G.** Mature cypsela. (**A–G**, *P.Collier 3109*). All scale bars represent 1 mm.

(–7.0) mm long, 1.5 mm wide, slightly navicular, with darker midrib, dorsally white-woolly, sometimes slightly thickened at base. Inner bracts similar but broader, c. 1.8–2.0 mm wide, with subglabrous wing-like margins; central region white-woolly; wing margins ciliate, especially distally; tip rounded to acute, with a short terminal tuft of hairs. *Florets* c. 12–17 per capitulum, all bisexual, tubular. *Corolla tube* yellow, in 3 sections: basal section 0.5–0.6 mm long, swollen, 0.8 mm diam.; central section 3.3 mm long, slender, 0.4 mm diam.; terminal section 0.8–0.9 mm long, swollen, campanulate, 0.75 mm diam., with 5 strap-shaped corolla lobes c. 2 mm long and variously twisted or curled after anthesis. *Anther* tube 1.6–2.1 mm long; anther appendages linear, c. 0.5 mm long, narrower than thecae. *Style* arms c. 1.7 mm long, thick, blunt, with short antrorse hairs on abaxial surface. *Cypsela* dark purplish black, approximately cylindrical, 2.5–2.9 mm long, 0.8 mm diam. in centre, tapering very slightly to each end, faintly reticulate, with c. 12–14 longitudinal ribs; pappus persistent; pappus ring unlobed. *Figure 2.*.

Ecology: Found in a range of habitats, usually somewhat wetter than those described for subsp. *oblongifolius*. Frequently a shrub in the understorey of *Eucalyptus delegatensis* (sometimes *E. auygdalina*) forest, often on stony soils. While many collections are from river valleys, other specimens are described as growing only on ridges, or on scree slopes. Flowering occurs December–January, fruits are present until March, and old empty capitula remain on the plant year-round.

Distribution: Endemic to Tasmania. Most common in the Central Highlands region, but extending also to the Furneaux, North East, East Coast, Ben Lomond, West Coast and South West regions. Generally found at slightly higher altitudes (to 1130 m) than subsp. *oblongifolia*, especially where the two abut in distribution on the East Coast, but descending to sealevel on the south coast. *Figure 1D.*

Specimens examined (selection only): FURNEAUX: *P.J.Cullen s.n.*, 31.i.1990, Flinders Island, Brougham Sugarloaf (HO128675); *L.Rodway 423*, -.i.1895, Flinders Island (HO); *J.S.Whinray 8987 & 9386*, 7.i.1991, State Forest in the upper NW corner of Badger Gully (AD, CANB, HO, NSW); *J.S.Whinray 9351*, no date, State Forest 1 km E of Sugarloaf (AD, CANB, HO, MEL). NORTH EAST: *T.E.Burns 183*, 5.xii.1959, Prossers Forest (HO); *A.M.Buchanan 10549*, 2.x.1987, above Pipers River near Karoola (HO). BEN LOMOND: *A.M.Buchanan 219*, 21.iv.1980, Mt Barrow, north-east slopes (CHR, HO); *P.Collier 1291*, 18.iii.1986, Ben Nevis (HO). CENTRAL HIGHLANDS: *A.M.Buchanan 128*, 1.i.1980, head of Arm River/Pelion Track (AD, AK, HO); *N.T.Burbidge 3419*, 6 miles [9.5 km] SW of Great Lake (K); *A.M.Gray s.n.*, 10.i.1977, Derwent Bridge, Lyell Highway (AK, CANB, HO); *A.Moscal 1474*, 22.i.1983, Howell's Bluff, Fish River, Walls of Jerusalem (AD, HO, MEL). WEST COAST: *A.M.Buchanan 11631*, 25.i.1990, Brassey Hill (HO); *A.M.Buchanan 13390*, 10.vi.1993, Duffs Hill, Heazlewood River (HO). EAST COAST: *A.M.Buchanan 7406*, 26.xi.1985, E Road, above Picaninny Creek (HO); *P.Collier 651*, 15.ix.1985, N of The Basin, Ouse River (HO). SOUTH WEST: *P.Collier 2848*, 26.ix.1987, Sullivan Point, Recherche Bay (HO); *K.D.Nicolls s.n.*, 17.xii.1978, South Cape Bay, c. 1.5 km SE of Lion Rock (AK, HO).

Discussion: The majority of plants have leaves with a length:width ratio of 15–20. Occasional plants have shorter leaves in which the ratio approaches 10x, especially in the Prossers Forest/Ben Nevis/Mt Barrow region, but also elsewhere. These can be distinguished from narrow-leaved forms of *B. linearis* var. *oblongifolia* by their slightly tapering leaf tips and shorter involucral bracts. It should be noted that hybrids, *B. linearis* x *B. salicina*, also occur on Mt Barrow (e.g. *Jackson s.n.*, HO62110), and that some of these (particularly backcrosses) can also resemble *B. linearis* subsp. *linearis*.

A collection from Lake Sorell (*Moscal 19281*, HO144419) is somewhat intermediate between subsp. *linearis* and subsp. *oblongifolius* in leaf shape and size (20–23 x 2–2.5 mm) and underlines the close relationship between these two taxa. It has been included here under subsp. *linearis* because its capitular bracts measure only 5–6 mm, more in keeping with that subspecies. Other small leaved forms of subsp. *linearis* can be found in the Launceston/Mt Barrow area (for example HO98134, HO62111, HO36230). However, other collections from the same area (for example HO36138) are clearly subsp. *linearis*.

In inland collections, as the leaf matures the epidermis on the lower surface and one or two layers of the underlying parenchyma separate from the remaining parenchyma and form elongated inflated voids alongside the midrib. These voids are clearly visible in transverse section at 10x magnification. In lowland/coastal collections (e.g. from the south coast, Brassey Hill, Karoola and Flinders Island) the parenchyma around the lower side of the midrib increases in size and therefore there is no separation and no development of voids.

Bedfordia linearis subsp. ***oblongifolia*** Orchard, *subsp. nov.*

Diagnosis: Frutices subsp. *linearem* simulans, sed foliis oblongis vel anguste oblongis (longitudine:latitude minus quam 10:1), apicibus foliorum rotundatis, differt.

Type (here designated): *A.M. Gray 596*, 9.xii.1981, Tasmania: Summerleas Road, c. 1.5 km from Ferntree. Holotype: HO46635. Isotypes: AD, AK, MEL.

Shrubs 1–2 (–3) m tall. Young *branches* densely white-woolly, becoming discoloured with age, at first with yellowish resin, later with dust adhering to resin; bark dark grey/black. *Leaf* lamina oblong to narrowly oblong, spreading, straight or sigmoidly curved with tips upwardly curved, (6–) 10–20 (–45) mm long, (1.5–) 2–3 mm wide, length:width ratio 3–10; tip rounded, blunt; margin revolute. Lower leaf surface glabrous apart from scattered glandular hairs, obscured by dense white woolly hairs arising from the midrib and interlocking with usually sparse similar hairs on the upper and lower surface of the revolute margins; midrib with or without a longitudal subcuticular void on each side; petiole c. 1 mm long, persistent as a peg after leaf fall. *Peduncle* 2–7 (–13) mm long, white-woolly, with 3 linear bracts 1.5–2 mm long. *Capitular bracts* in 2 whorls of usually 4 each. Outer bracts narrowly lanceolate, often slightly thickened at base, (4.5–) 5–7.5 (–8.0) mm long, 1.4 mm wide, slightly navicular with darker midrib, dorsally white-woolly; tip rounded or blunt, sometimes almost acute, with a terminal hair tuft. Inner bracts similar but broader, 1.7–2.0 (–2.5) mm wide; tip rounded to acute. *Florets* 9–17 per capitulum, all bisexual, tubular. *Corolla tube* cream to yellow, in 3 sections: basal section swollen; central section slender; terminal section campanulate, with 5 ligulate lobes. *Anther* tube brown; anther appendages linear, narrower than thecae; anther tails short. *Style* arms thick, blunt, with short antrorse hairs on abaxial surface. *Cypsela* dark purplish black (sometimes deep red-brown with lighter brown ribs), approximately cylindrical, 2.9–3.3 mm long, 0.7–1.0 mm diam., tapering slightly to base, with 10–12 paired longitudinal ribs, throughout faintly reticulate; pappus persistent; pappus ring weakly 5-lobed.

This subspecies comprises 2 varieties (see key under generic description, above):

Bedfordia linearis (Labill.) DC. subsp. ***oblongifolia*** var ***oblongifolia***

Shrubs 1–2 m tall. *Leaf* lamina straight, spreading at 90° to stem, oblong to narrowly oblong, 10–20 (–45) mm long, (1.5–) 2.5–3 mm wide, length:width ratio c. 5–10; tip rounded, blunt; lower midrib with or without voids. *Inflorescences* of single pedunculate capitula in upper leaf axils (rarely a few lower axils with 3–5-capitular inflorescences). Peduncles 5–7 (–13) mm long. Outer *capitular bracts* (6.0–) 6.5–7.5 (–8.0) mm long; inner capitular bracts 1.8–2.0 mm wide. *Florets* c. 12–17 per capitulum. *Corolla tube* cream; swollen basal section 0.4 mm long, 0.8 mm diam.; slender central section 2.1 mm long, 0.4 mm diam.; terminal campanulate section 1.2–1.6 mm long, 1.0 mm diam.; corolla lobes 1.5–2.0 mm long, strongly reflexed/curled. *Anther* tube 1.7–1.8 mm long; appendages c. 0.5 mm long. *Style* arms c. 1.6 mm long. *Cypsela* 3.3 mm long, 1.0 mm diam., with 10 paired reddish brown vertical ribs. *Figure 3A–E.*

Ecology: Most collections are described as coming from dry stony dolerite soils in open *Eucalyptus* forest. On the Central Highlands the forest is usually *E. delegatensis*,

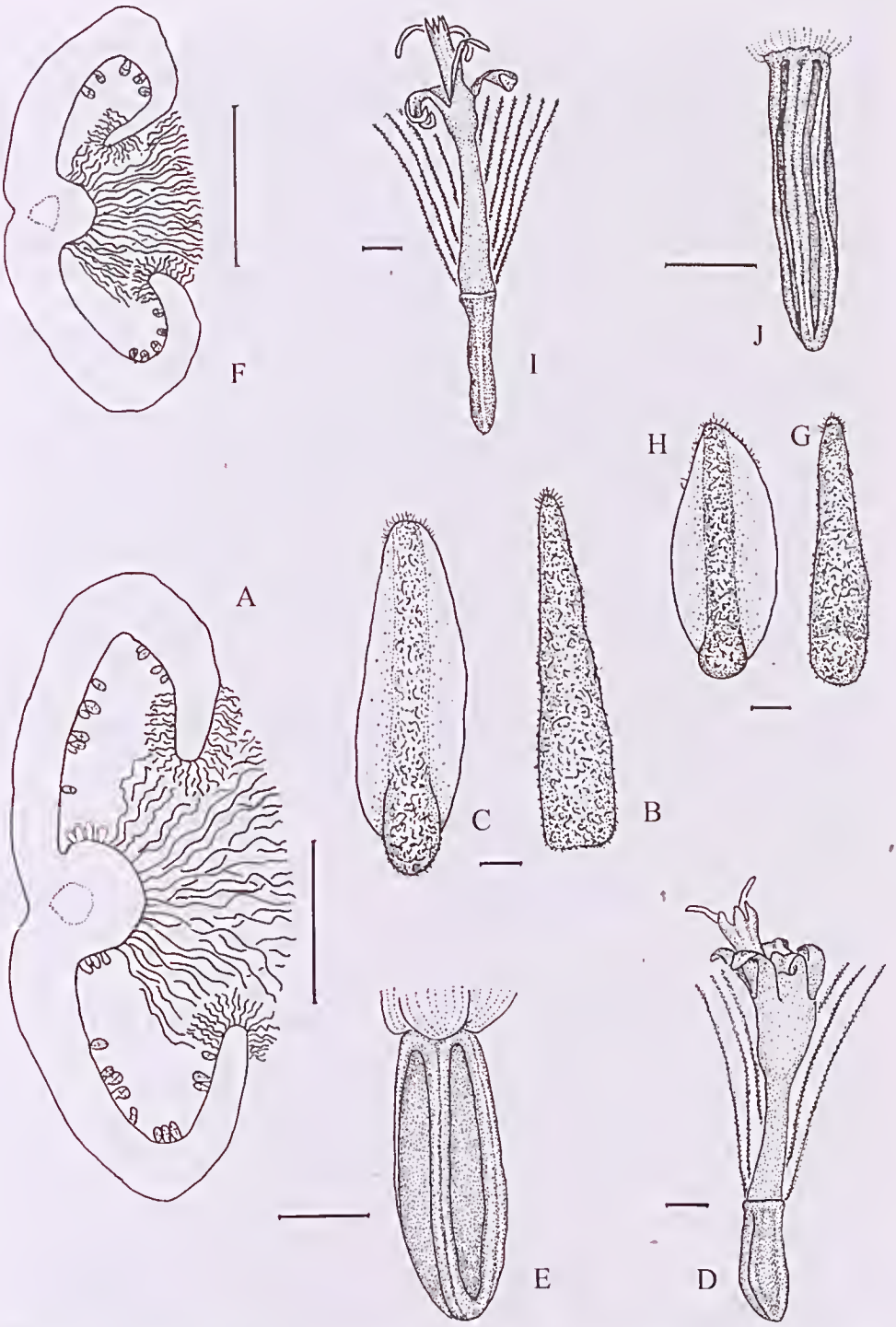

Figure 3. *Bedfordia linearis* subsp. *oblongifolia*. **A–E.** var. *oblongifolia*. **A.** Leaf cross section (semidiagramatic). **B.** Outer capitular bract (dorsal view). **C.** Inner capitular bract (dorsal view). **D.** Floret (some pappus bristles removed). **E.** Mature cypsela. **F–J.** var. *curvifolia*. **F.** Leaf cross section (semidiagramatic). **G.** Outer capitular bract (dorsal view). **H.** Inner capitular bract (dorsal view). **I.** Floret (some pappus bristles removed). **J.** Cypsela (slightly immature). (**A–D**, *A.M.Gray 596*; **E.** *L.Rodway s.n.*, HO9739; **F–J**, *A.E.Orchard 5160*). All scale bars represent 1 mm.

with a shrubby understorey of *Bedfordia linearis*, *Leptospermum lanigerum*, *Callistemon viridiflorus*, *Helichrysum thyrsoideum*, *Hakea lissosperma*, *Notolaea ligustrina*, *Acacia ulicifolia* and *Poa labillardieri*. On the East Coast the dominant trees are *E. pauciflora*, *E. amygdalina*, *E. pulchella*, *E. tenuiramis*, *E. delegatensis* or *E. globulus*, and the associated shrubs include *Hakea epiglottis*, *Parahebe formosa* and *Westringia rubiaefolia*. Soils are usually described as dry, but a few collections are from the margins of marshes, and these plants tend to be unusually robust. Altitudinal range is 280–550 m in the East Coast region, extending to 1000–1090 m in the Central Highlands and Ben Lomond regions. Flowering occurs (October–) December–February, fruiting in February. Remains of old heads are retained on the plant for about 12 months.

Distribution: Endemic to Tasmania. Most common in the East Coast region between the Douglas/Apsley Rivers and Hobart/Mt Wellington, with outliers in the Central Highlands and Ben Lomond regions. *Figure 4A*.

Specimens examined: CENTRAL HIGHLANDS: *A.M.Buchanan 15404*, 23.xii.1998, Tods Corner, Great Lake (HO); *A.Moscal 17046*, 24.ii.1989, Mountain Creek (HO); *A.Moscal 18368*, 11.i.1990, Catheart Bluff (CANB, HO); *A.Moscal 18815*, 11.ii.1990, Snowy Knob (HO); *A.Moscal 19281*, 19.iii.1990, Tods Hill, Lake Sorell (HO); *A.Moscal 19371*, 25.iii.1990, 1.5 km W of Sandbanks Tier (HO). BEN LOMOND: *G.Williams s.n.*, 19.iii.1993, Rigney Hills area (HO). EAST COAST: *M.Allan s.n.*, 12.ii.1989, near upper Douglas River on track to Heritage Falls (HO); *M.J.Brown 192*, 3.v.1983, slope W of Apsley River (HO); *P.Collier 965*, 3.xi.1985, north side of Mt Andrew (HO); *F.Duncan s.n.*, 8.xii.1987, 'O' Road, S of Swilly Marsh (HO); *F.Duncan s.n.*, 25.xi.1993, Rigney Hills (HO); *A.V.Giblin s.n.*, 15.x.1929, New Town Creek (HO); *A.M.Gray s.n.*, Summerleas Road, 2 km from Huon Highway (HO); *A.M.Gray 778*, 14.i.1995, North M Road, Black Marsh (HO); *A.M.Gray 813c*, 5.ix.1996, corner of Valley Road and Meadstone Falls Road (HO); *A.Moscal 173*, Mt Allen marsh, summit of Mt Allen, near Bicheno (HO); *A.Moscal 245*, 20.iii.1980, Bedggood Hill, ridge near Stonyford Creek watershed (HO); *A.Moscal 285*, 9.iv.1980, Horseshoe Marsh, St Pauls River (HO); *A.Moscal 936*, 6.iii.1982, Storeys Creek, 4 km upstream

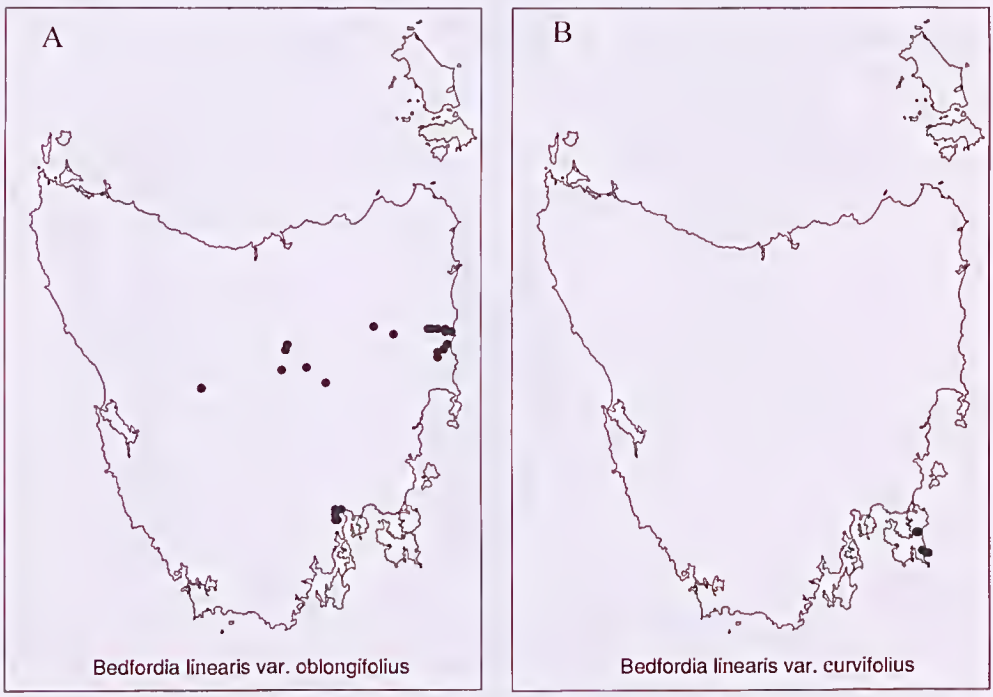

Figure 4. Distribution maps. **A.** *Bedfordia linearis* var. *oblongifolius*. **B.** *Bedfordia linearis* var. *curvifolius*.

from Aberfoyle Homestead (HO); *A.Moscal 26424*, 24.xii.1994, Thompson's Marshes (HO); *A.F.Oldfield 217*, swamp near the NW Bay Rivulet, Huon Track (K); *A.V. & D.A.Ratkowsky 945*, 29.xi.1973, Dunns Creek, between Chimney Pot and Ridgeway (HO); *L.Rodway s.n.*, 15.i.1893, near Fern Tree (HO); *D.Ziegeler 56*, 13.vi.1988, Horseshoe Marsh, Eastern Tiers (HO).

Discussion: Plants of this variety on Mt Wellington lack the voids alongside the lower surface of the midrib. Plants from the east coast vary, some having voids, others lacking them.

The collection *Collier 965* from Mt Andrew has very narrow leaves for this variety (1.5 mm), but its leaf proportions suggest it belongs here.

Some plants from dry places on the slopes of Mt Wellington (e.g. *Ratkowsky & Ratkowsky 945*; *Rodway s.n.*, HO9739) have shorter than normal leaves (10–12 mm long; ratio l:w = 3–4), and superficially resemble var. *curvifolia*. However, the leaves are more or less straight, not sigmoid with upwardly curved tips, and the capitular peduncles are 4–5 mm long, suggesting that these are just depauperate var. *oblongifolia*, not var. *curvifolia*. The collection *Moscal 936* from Storeys Creek also superficially resembles var. *curvifolia*, but its long peduncles suggest it belongs in var. *oblongifolia*.

Most plants have inflorescences consisting of single capitula in the axils of the upper leaves. However very robust plants from Mt Wellington (e.g. *Gray s.n.*, HO27375) have occasional irregular panicles of 3–5 capitula in some of the lower fertile leaf axils. Even in these plants, most axils bear only a single capitulum.

Another collection (*Gray 778*) from Black Marsh is also very robust and has leaves to 45 mm long. However, in leaf width (3–4 mm) and peduncle length (2–3 mm) this plant belongs here.

Bedfordia linearis subsp. ***oblongifolia*** var. ***curvifolia*** Orchard, *var. nov.*

Diagnosis: Frutices var. *oblongifoliam* simulans, sed foliis sigmoideo-curvatis, apicibus erectis, (6–) 10–12 mm longis, longitudine:latitude 3–5:1; pedunculis c. 2–4 mm longis; bracteis capitularibus exterioribus (4.5–) 5–6 mm longis; bracteis capitularibus interioribus 1.7–2.0 (–2.5) mm latis; floribus c. 9 vel 10 per capitulum; tubis corollarum flavis; tubis antherarum 1.3–1.5 mm longis; brachiis stylorum 1.3 mm longis; acheniis 2.9–3.3 mm longis, 0.7 mm latis, costis verticalibus 12 infirme binatis rubello-purpureis, differt.

Type (here designated): *A.E. Orchard 5160*, 18 Dec. 1980, Tasmania: East Coast, Fortescue Bay – Cape Hauy track, top of first ridge. Dry stony ridge, in *Eucalyptus*, *Banksia marginata*, *Casuarina* open forest; *Hakea* and *Acacia mucronata* understorey; infrequent. Holotype: HO. Isotypes: AD, AK, CANB, CHR, MEL, NSW, WELT.

Shrubs 1–2 (–3) m tall. *Leaves* sigmoidally spreading with tips upwardly curved, oblong, (6–) 10–12 mm long, 2–3 mm wide, length:width ratio 3–5; tip rounded, blunt; voids alongside midrib apparently absent. Inflorescences of single pedunculate capitula in upper leaf axils. *Peduncles* c. 2–4 mm long. Outer capitular bracts (4.5–) 5–6 mm long; inner capitular bracts 1.7–2.0 (–2.5) mm wide. *Florets* c. 9 or 10 per capitulum. *Corolla* tube yellow; swollen basal section c. 0.5 mm long, 0.5 mm diam.; slender central section 2.0–2.5 mm long, 0.2 mm diam.; terminal campanulate section 0.7–0.8 mm long, 0.5 mm diam.; corolla lobes c. 1.5 mm long, reflexed. *Anther* tube 1.3–1.5 mm long; appendages c. 0.4 mm long. *Style* arms 1.3 mm long. *Cypsela* 2.9–3.3 mm long, 0.7 mm diam., deep purple-black with 12 weakly paired reddish-purple vertical ribs (rarely deep red brown with lighter brown ribs). *Figure 3F–J*.

Ecology: Most collections are described as coming from dry stony ridges in open *Eucalyptus* forest, at altitudes of up to 150 m. Associated shrubs are *Banksia marginata*, (*Allo*)*Casuarina* spp., *Hakea* sp. and *Acacia mucronata*. The collection from Fortescue Forest Reserve (*Moscal 30133*) is described as growing on dolerite rubble around the edge of a wetland slope in wet heathland. It was growing in sparse *Eucalyptus amygdalina*

forest with *Sprengelia incarnata*, *Gleichenia dicarpa*, *Lepidosperma elatius*, *Leucopogon collinus*, *Bauera rubioides*, *Allocasuarina verticillata* and *Xyris*. It is more robust than collections from drier areas, but shares their short sigmoidly curved leaves and short capitular peduncles. Flowering and fruiting seems to be confined to November–December, with only remnant old empty heads remaining on the plants by March.

Distribution: Endemic to Tasmania. This variety seems to be confined to a small number of localities on Tasman Peninsula, between Eaglehawk Neck and Cape Hauy. *Figure 4B*. It is locally reasonably common, but its limited distribution, albeit mostly in reserves of one sort or another, poses some threat to its continued survival. A collection from Storeys Creek (*A.Moscal 936*) superficially resembles this variety, with short, curved leaves. However it has very long capitular peduncles (to 10 mm or more) and is probably best considered as a slightly anomalous plant of var. *oblongifolia*.

Specimens examined: EAST COAST: *I.Boyer s.n.*, 7.xii.1980, track to Cape Hauy (HO40710); *A.M.Buchanan 10884 & 10885*, 27.iii.1988, Cashs Lookout, Eaglehawk Neck (HO); *A.M.Gray 593, 594 & 595*, 9.xii.1981, Cashs Lookout (HO); *W.D.Jackson s.n.*, Fortescue Bay, Cape Hauy Track (HO50714); *A.M.Moscal 30133*, 26.xi.1998, Fortescue Forest Reserve (HO).

Discussion: The cypselas of this variety are usually deep purple black with reddish-purple ribs, occasionally, however, they are lighter in colour, deep red-brown with lighter brown ribs.

Acknowledgments

The author thanks the curators of the herbaria who provided access to collections to support this project (AD, CANB, HO, K, MEL, NSW), and to Mr Lee Halasz who prepared the maps. Miss Annette Wilson kindly assisted with data collation and proof reading, but any remaining errors, alas, are the responsibility of the author.

References

Bentham, G. (1867). *Flora Australiensis* vol. 3. Lovell Reeve & Co., London.

Bick, I.R.C., Bremner, J.B., Paano, A.M.C. & Preston, N.W. (1991). *A Survey of Tasmanian Plants for Alkaloids*. University of Tasmania: Hobart.

Buchanan, A.M. (ed.) (1999). *A Census of the Vascular Plants of Tasmania & Index to The Student's Flora of Tasmania, Third Edition*. Tasmanian Herbarium Occasional Publication No. 9, Tasmanian Herbarium: Hobart.

Candolle, A.P. de (1833). *in* J.B.A.Guillemin, *Archives de Botanique* vol. 2, pp 332–333. Privately published: Paris.

Ewart, A.J. (1931). *Flora of Victoria*. Victorian Government Printer: Melbourne.

Hochreutiner, B.P.G. (1934). Plantae Hochreutineranae Fascicule III, *Candollea* 5: 175–341.

Hooker, J.D. (1856). *The Botany of the Antarctic Voyage of H.M. Discovery Ships Erebus and Terror in the Years 1839–1843. III. Flora Tasmaniae Part 1*. Reeve Brothers: London.

Jeanes, J.A. (1999). *Bedfordia*, pp. 965–967, in N.G.Walsh & T.J.Entwisle (eds), *Flora of Victoria Vol. 4 Dicotyledons Cornaceae to Asteraceae*. Inkata Press: Melbourne.

Labillardière, J.J.H. de (1806). *Novae Hollandiae Plantarum Specimen*. Dominae Huzard: Paris.

Maiden, J.H. & Betche, E. (1916). *A Census of the New South Wales Plants*. Government Printer: Sydney.

Mueller, F.J.H. (1858). *Catalogue of Plants Under Cultivation in the Melbourne Botanic Garden*. Government Printer: Melbourne.

Mueller, F.J.H. (1882). *Systematic Census of Australian Plants*. M'Carron Bird & Co. for Victorian Government: Melbourne.

Mueller, F.J.H. (1888). *Key to the System of Victorian Plants* vol. 1. Government Printer: Melbourne.

Mueller, F.J.H. (1889). *Second Systematic Census of Australian Plants*. M'Carron Bird & Co for Victorian Government: Melbourne.

Willis, J.H. (1967). Systematic notes on the indigenous Australian flora, *Muelleria* 1: 117–163.

Muelleria 19: 95–00 (2004)

Olearia brevipedunculata (Asteraceae): a new species from alpine areas of mainland Australia

Neville G. Walsh

National Herbarium of Victoria, Royal Botanic Gardens Melbourne, Private Bag 2000, Birdwood Ave, South Yarra, Victoria 3141. Neville.Walsh@rbg.vic.gov.au

Abstract

The illegitimate name *Olearia phlogopappa* (Labill.) DC. var. *subrepanda* (DC.) J.H. Willis has long been misapplied, at least in mainland Australia. The variety is apparently confined to Tasmania. The mainland taxon to which the name has been applied is endemic in higher subalpine and alpine areas of New South Wales and Victoria. It is described as a new species, *Olearia brevipedunculata* N.G. Walsh.

Introduction

Willis (1956) made the combination *Olearia phlogopappa* (Labill.) DC. var. *subrepanda* (DC.) J.H. Willis based on *Eurybia subrepanda* DC. (1836) for a taxon he believed occurred in the alps and subalps of mainland Australia and at lower altitudes in Tasmania. The types of *Eurybia subrepanda* are of Tasmanian plants ("in Novae Holl. insulâ King prope fretum Bass (itin. Baudin!) et in insulâ Van-Diemen prope Hobart-town (D'Urville! Gunn!.") (de Candolle 1836). Plants in the de Candolle herbarium, and the one illustrated in Hutchinson (1917) (as *O. subrepanda* (DC.) Huteh.) have narrow-oblong, discolorous leaves that appear to be glabrescent above, whitish-tomentose beneath, and have capitula in a compound, subsecund infloreseence, features typieal of other taxa reeognised within *O. phlogopappa sens. lat.* (Willis 1956, Curtis 1963). Irrespective of Willis's misinterpretation, his combination is illegitimate as the taxon had already been recognised at varietal level as *Eurybia gunniana* Hook. f. var. *cana* Hook. f. and this varietal epithet has priority under Artiele 11.4 of the Code (Greuter 2000).

Tasmanian speeimens determined as *O. phlogopappa* var. *subrepanda* in HO accord with De Candolle's types, as do several specimens in MEL of *O. phlogopappa* eollected from King Is. (one of the type localities for *Eurybia subrepanda*) and other Bass Strait islands. However the infraspeeifie taxonomy in *O. phlogopappa* is notoriously diffieult (e.g. see Curtis, 1963) and it is beyond the scope of this paper to attempt resolution of this complex. J.D. Hooker (1847) deseribed seven varieties under *Eurybia gunniana* (a synonym for *Olearia phlogopappa* (Labill.) DC., based on *Aster phlogopappus* Labill.) without eiting type material, and subsequently, in the *Flora of Tasmania* (Hooker, 1856) ineluded an eighth. In this aecount he noted the diffieulty of the group and in indicating his uncertainty of the distinctness of some of these varieties stated 'some no doubt may belong to different parts of the same bush'! The possibility of this being the case is suggested by his inclusion of the same Gunn number (Gunn 273) as typifying two of his varieties (var *brevipes* and var. *cana* – the latter a synonym of *Eurybia subrepanda* DC.). However, as pointed out by Burns & Skemp (1961) and others, Gunn's like-numbered specimens are not neeessarily duplieates, but represent specimens of varying provenanee he believed to belong to the same taxon. Curtis (1963) and Willis (1956) effected eombinations of seven varieties of *O. phlogopappa* to aecommodate Hooker's entities and *O. flavescens* Huteh. and these are all maintained in recent State censuses of Tasmania and Vietoria (Buchanan 1999; Ross & Walsh 2003), but no infraspeeifie taxa were recognised in the Flora of New South Wales (Lander 1992). As well as the eonfusion contained within *O. phlogopappa*, the

distinction between this species, *O. stellulata* and *O. lirata* is slight at the extremes of their variation (Lander 1992: Walsh & Lander 1999).

Notwithstanding the above, the plant to which the name *O. phlogopappa* var. *subrepanda* has been applied in New South Wales (Costin et al. 2000) and Victoria (Willis 1973: Walsh & Lander 1999) is a very distinctive alpine and high-subalpine taxon with more or less concolorous leaves and solitary, terminal and sessile or very shortly pedunculate capitula. It does not appear to be very closely related to any of the varieties otherwise included within *O. phlogopappa sens. lat.*, all of which have more or less racemose or paniculate inflorescences and to a greater or lesser extent, discolorous leaves. Consequently, the mainland plant previously referred to *O. phlogopappa* var. *subrepanda* is here recognised at specific rank.

Taxonomy

Olearia brevipedunculata* N.G. Walsh *sp. nov.

Ab *O. phlogopappa* (Labill.) DC. et speciebus affinibus capitulis singularibus terminalibus brevipeduncularis vel subsessilibus, foliis parvioribus argenteo-cinereis uniformiter prope differt.

Type: New South Wales, Southern Tablelands, Kosciuszko National Park, Charlottes Pass, *K.L. McDougall 1078*, 11.xii.2002 (holotype: MEL; isotypes CANB, NSW).

[*Olearia phlogopappa* var. *subrepanda* auct. non (DC.) J.H. Willis: J.H. Willis, *Muelleria* 1: 32 (1956); A. Costin *et al.*, *Kosciuszko Alpine Flora* edn 1, 365, fig. 313 (1979); edn 2, 337, fig. 204 (2000); M. Morcombe, *Australian Wildflowers* 22 (1970); N.G. Walsh & N.S. Lander in N.G. Walsh & T.J. Entwisle (eds), *Flora of Victoria* 4: 899, fig. 182h (1999), *comb. illeg.*]

Aster stellulata var. *glacialis* F. Muell. *in sched.* (MEL 2154359)

Foliose *shrub* to c. 1 m high, with stems ±erect, densely whitish tomentose with fine stellate trichomes in upper parts, glabrescent below. *Leaves* alternate, sessile to subsessile, somewhat stem-clasping at base, elliptic to obovate, 5–15 mm long, 2–6 mm wide, obtuse or rounded, margins entire or unevenly crenate, nearly concolorous, overall silvery or whitish-grey from a close tomentum of stellate trichomes, often somewhat sparser above, the undersurface often yellowish on younger leaves. *Capitula* 15–22 mm diam., solitary and terminal, sessile or on short peduncles not exceeding the subtending leaves at anthesis, but sometimes elongating to c. 15 mm in fruit. *Involucre* ±hemispherical, 4–6 mm long; *bracts* 3- or 4-seriate, eglandular, grading from the shorter outermost to longer innermost; outermost bracts ovate, c. 2 mm long, densely stellate-tomentose abaxially; innermost bracts oblong or narrowly ovate, evenly tomentose, or often glabrescent in lower half and densely stellate tomentose near tip; margin glabrescent, fimbriolate near tip, often crimson, sometimes the entire bract crimson. *Ray florets* 12–22, white, ligules 5–9 mm long, entire to minutely tridentate at tip; *disc florets* 18–30, yellow, 5–6 mm long. *Cypselas* flattened-cylindric, obscurely ribbed, c. 3 mm long, sericeous; pappus bristles barbellate, 5–6 mm long, the outer row often including a few shorter bristles c. 1 mm long. Flowers Dec.-Jan. (Fig. 1)

Etymology: The epithet refers to the very short peduncles.

Representative specimens examined: NEW SOUTH WALES: Munyang Mountains, *F. Mueller s.n.* i.1874 (MEL); Mt Kosciuszko, *J. Findlay s.n.*, 1883 (MEL); Kosciuszko National Park, Ogilvies Ck, *N.G. Walsh 5704*, 18.xii.2002 (MEL); Kosciuszko National Park, c. 3 km from Charlottes Pass, *K.L. McDougall 1077*, 11.xii.2002 (CANB, MEL). VICTORIA: Bogong High Plains near Cope Hut, *G.W. Carr 5786*, 4.ii.1975 (MEL); Alpine National Park, Mt Bogong area, Quartz Ridge Track, *N.G. Walsh 5724*, 3.i.2003 (MEL, CANB).

HOLO-
TYPE
National Herbarium of Victoria (MEL)
HOLOTYPE
Olearia brevipedunculata H.Gibbs
Determinavit H.Gibbs 23.iv.2003
NATIONAL HERBARIUM OF VICTORIA (MEL)
MELBOURNE, AUSTRALIA
MEL 2154358
319 ASTERACEAE
Olearia phlogopappa (Labill.) DC.
var subrepanda (DC.) J.H Willis
Coll McDougall, K.L. 1078 Date: 11 Dec 2002
AUSTRALIA : NEW SOUTH WALES
Region/District: Southern Tablelands
Locality. Kosciuszko National Park, Charlottes Pass End of Kosciuszko Rd near beginning of Summit Walk.
Lat.: 36°26'00"S Long : 148°19'30"E
Alt : 1850m
Notes. Snow gum woodland with shrubby understorey, c. 1 m high.
Locally common
Dupls CANB, NSW
NATIONAL HERBARIUM OF VICTORIA (MEL), AUSTRALIA

Figure 1. Holotype of *Olearia brevipedunculata*

Olearia brevipedunculata differs from *O. phlogopappa* and closely allied species in the smaller, nearly concolorous leaves and terminal, solitary, sessile or shortly pedunculate capitula.

The species appears to be confined to higher subalpine and alpine areas of New South Wales, in Kosciuszko National Park from near Round Mountain (and, according to unvouchered survey records, perhaps Mt Selwyn), south to Mt Kosciuszko, and Victoria, in the Alpine National Park on the Bogong High Plains (including Mt Bogong) and Mt Cobberas area. It appears to be absent from areas closely adjacent to the Bogong High Plains where it might be expected to occur (e.g. Mt Hotham, Mt Wills) but further searches may indicate a broader range than is currently known. Records of *O. phlogopappa* var. *subrepanda* from the Baw Baws, Victoria, refer to another, probably undescribed taxon. *Olearia brevipedunculata* occurs mainly in heathland, usually in rocky sites, sometimes in association with *O. phlogopappa* var. *flavescens* (Hutch.) J.H. Willis, and often with *Prostanthera cuneata*, *Grevillea australis*, *Orites lancifolia*, *Phebalium squamulosum* ssp. *alpinum* and/or *Neomatolepis ovatifolia*. At some sites *Eucalyptus pauciflora* is present above a similar shrubby understorey.

Olearia brevipedunculata is localised, probably rare (2RCa in the sense of Briggs & Leigh (1996)), but not threatened. With the exception of those areas in the Falls Creek Alpine Resort area on the Bogong High Plains, all occurrences of the species appear to be conserved in Kosciuszko National Park, New South Wales, and in the Alpine National Park, Victoria.

As indicated above, the name *Olearia phlogopappa* var. *subrepanda* is illegitimate. This leaves Tasmanian plants previously referred to that name without a valid combination under *Olearia*, the only validly published name being *Eurybia gunniana* Hook. f. var. *cana* Hook. f. Although the appropriate combination could be made here, I believe it is preferable to await a thorough revision of *O. phlogopappa* to avoid the possibility of creating a trinomial which may turn out to be superfluous or short-lived.

Acknowledgements

I am grateful to Keith McDougall (New South Wales National Parks and Wildlife Service) for collecting the type and for providing information on the distribution of the species within Kosciuszko National Park, to Alex Buchanan (HO), for information on *Olearia* specimens held at that institution, to Teresa Lebel and Simon Lewis (MEL) for assistance with imaging, and two anonymous referees for suggesting improvements to an earlier draft of this paper.

References

Briggs, J.D. & Leigh, J.H. (1996). *Rare or Threatened Australian Plants* (1995 revised edition). CSIRO Publishing: Collingwood.

Buchanan, A.M. (ed.) (1999). *A census of the vascular plants of Tasmania* (3rd edn). Tasmanian Herbarium Occasional Publication no 6: Hobart.

Burns, T.E. & Skemp, J.R. (1961). Van Diemen's Land correspondents. *Records of the Queen Victoria Museum, Launceston* **14**.

Candolle, A.L.P. de (1836). *Prodromus Systematis Naturalis Regni Vegetabilis* (vol. 5). Treuttel & Würtz: Paris.

Costin, A., Gray, M., Totterdell, C. & Wimbush, D. (2000). *Kosciuszko Alpine Flora*, (2nd edn). CSIRO Publishing: Collingwood.

Curtis, W.M. (1963). *The Student's Flora of Tasmania* (vol. 2). Govt Printer: Tasmania.

Greuter, W. (ed.) (2000). *International Code of Botanical Nomenclature, St Louis code 2000*. Koeltz: Königstein, Germany.

Hooker, J.D. (1847). Florae Tasmaniae spicilegium; or a contribution toward a flora of Van Diemen's Land. *Hooker's London Journal of Botany* **6**,106–125.

Hooker, J.D. (1856). *The Botany of the Antarctic Voyage of H.M. Discovery Ships Erebus and*

Terror: Part III, Flora Tasmaniae (vol. 1(3)). Reeve: London.
Hutchinson, J. (1917). *Olearia gunniana* and its allies. *The Gardener's Chronicle* (ser. 3) **61**, 3.
Lander, N.S. (1992). '*Olearia*', in G.J. Harden (ed.), *Flora of New South Wales* **3**, 185–197. University of New South Wales Press: Kensington.
Ross, J.H. & Walsh, N.G. (2003). *A Census of the Vascular Plants of Victoria* (7th edn). Royal Botanic Gardens: Melbourne.
Walsh, N.G. & Lander, N.S. (1999). '*Olearia*' in N.G. Walsh & T.J. Entwisle (eds), *Flora of Victoria* **4**, 886–912. Inkata Press: Melbourne.
Willis, J.H. (1956). Systematic notes on Victorian Compositae 1. *Muelleria* **1**, 24–33.

Muelleria 19: 101–214 (2004)

Taxonomic studies of Australian *Senecio* (Asteraceae): 1. The disciform species

Ian R. Thompson

School of Botany, The University of Melbourne, Victoria 3010, Australia.
Email: I.Thompson@unimelb.edu.au

Abstract

Morphological studies of Australian disciform *Senecio* (central florets of the capitulum bisexual and tubular, and marginal florets female and tubular) have resulted in the recognition of 18 new species, two new subspecies, and the resurrection of six names. The new species are: *S. brevitubulus* I.Thomps., *S. distalilobatus* I.Thomps., *S. dolichocephalus* I.Thomps., *S. extensus* I.Thomps., *S. hispidissimus* I.Thomps., *S. interpositus* I.Thomps., *S. lageniformis* I.Thomps., *S. longicollaris* I.Thomps., *S. longipilus* I.Thomps., *S. microbasis* I.Thomps., *S. nigrapicus* I.Thomps., *S. niveoplanus* I.Thomps., *S. oldfieldii* F.Muell. ex I.Thomps., *S. phelleus* I.Thomps., *S. psilophyllus* I.Thomps., *S. queenslandicus* I.Thomps., *S. scabrellus* I.Thomps., and *S. tasmanicus* I.Thomps. The new subspecies are: *S. multicaulis* A.Rich. subsp. *stirlingensis* I.Thomps., and *S. glomeratus* Desf. ex Poir. subsp. *longifructus* I.Thomps.

Senecio bathurstianus (DC.) Sch.Bip., *S. multicaulis* A.Rich., *S. prenanthoides* A.Rich., *S. glandulosus* (DC.) Sch.Bip., and *S. glabrescens* (DC.) Sch.Bip. are resurrected. *Senecio georgianus* DC. and *S. helichrysoides* F.Muell., the latter here resurrected; although discoid, are allied to the disciform group and are described here. A key to species is presented.

Introduction

Senecio L. is a large, cosmopolitan genus comprising over a thousand species, and species are predominantly radiate or discoid. However, in Australia about a third of the approximately 50, mostly endemic species are disciform, i.e. with central florets bisexual and tubular and marginal florets female, tubular, and with corollas significantly smaller than those of the central florets. Belcher (1956) coined the term erechthitoid for this group because of the resemblance in floret composition to *Erechtites*.

Although most disciform species are endemic to Australia, several occur in both Australia and New Zealand, and four are endemic to New Zealand. *Senecio diaschides* D.G.Drury and *S. bipinnatisectus* Belcher are considered naturalised in New Zealand (Drury 1974; Webb 1988). The paper by Drury presents excellent illustrations of several of the species that occur in Australia. Single disciform species of *Senecio* are endemic to New Guinea and Indonesia (Belcher 1956).

The first *Senecio* described for Australia was the disciform *S. quadridentatus* Labill. in 1807. Since that time, disciform species have been either placed in *Senecio* or *Erechtites*, the latter described to accommodate senecioid species with disciform capitula. The most active period for publication of names was in the 1830s when Richard (1834) placed new species in *Senecio*, while de Candolle (1838) placed new disciform species in *Erechtites* as well as transferring Richard's species to this genus. Bentham (1867) followed de Candolle in assigning disciform species to *Erechtites* but reduced the number of species to six, one of which has since been transferred to *Arrhenechthites* (Belcher 1956), and recognised four varieties. These taxa remained in *Erechtites* until 1956 when Belcher placed them all in *Senecio* based largely on a comparison of style morphology. The Australian disciform taxa corresponded better to *Senecio* in having "style arm apices truncated or low-domed rather than prolonged in an appendage of fused papillose hairs" and they could also be differentiated from *Erechtites s. str.* by having "smaller and less heavily-ribbed achenes and usually smaller capitula".

Apart from the absence of an androecium, female florets differ from bisexual ones by having smaller corollas with narrower limbs and often with shorter and/or fewer lobes. In the vast majority of Australian disciform species, female florets outnumber bisexual ones by a factor of two to three.

Belcher's work in 1956 included descriptions of new non-Australian disciform species, but for Australia no new species were described. Several modifications to the previous classification were made including creation of new names made necessary through nomenclatural requirements, resurrection of names, and changes of rank. Interestingly, after the recognition in 1865 of *Senecio bipinnatisectus* (as *Erechtites atkinsoniae* F.Muell. 109 years were to elapse before the next new taxon of any rank was described, and this was by Drury, a researcher from New Zealand, who described *S. diaschides* based on material growing adventively in New Zealand. Since then two new species have been described: *S. macrocarpus* Belcher (1983) and *S. psilocarpus* Belcher and Albrecht (1994), while Lawrence (1985a) elevated *S. minimus* Poir. var. *picridioides* (Turcz.) Belcher to the rank of species as *S. picridioides* (Turcz.) M.E.Lawr.

Harden (1992) and Walsh (1999), in their respective flora treatments for New South Wales and Victoria, demonstrated that the taxonomy of the disciform senecios in Australia required further research. Harden informally recognised two new species, sp. E and sp. N, while Walsh also informally recognised two new species, sp. 1 and sp. 2. In addition, Walsh, in notes under several species, indicated that taxonomic problems still existed.

The chromosome number and reproductive biology of Australian *Senecio*, including the disciform species, has been investigated by Lawrence (1980, 1985b). The disciform species were shown to be self-compatible in contrast to discoid and radiate species, with the exception of *S. glossanthus* (Sond.) Belcher, which were self-incompatible. Lawrence's chromosomal studies are discussed below.

Materials and Methods

Herbarium specimens from AD, BRI, CANB, DNA, HO, MEL, NE, NSW, and PERTH, were examined. Field observations and collections in Victoria and south-eastern New South Wales supplemented the herbarium data. The circumscriptions of, and morphological variation within, previously recognised taxa was critically assessed and new taxonomic concepts developed and tested when the taxonomy was found wanting. A new classification was founded largely on a more detailed characterisation of previously utilised characters. Several new characters such as root morphology, achenial shape and details of the achenial hairs were also used. Distribution maps were generated using the ArcView computer program.

Morphology

Habit and longevity: Most species appear to be short-lived perennials, although longevity in several species is uncertain due to a lack of sampling of below-ground parts. The above-ground parts may die back after the initial flowering and fruiting period, or they are variably persistent with ongoing branching and secondary phases of flowering for months after the initial period. Regeneration from year to year is from a short rootstock. A few species such as *Senecio runcinifolius* and *S. laceratus* appear to grow as annuals although they potentially could persist beyond one season if conditions allowed.

Stems are commonly erect, sometimes somewhat sprawling, and in species mainly at higher altitudes, sometimes creeping and/or ascending before becoming erect. The number of stems produced in the second season varies from one to many depending on the species but also partly depending on environmental conditions.

Branching is variable but in most species occurs predominantly above mid stem associated with the development of secondary panicles. In a few species, e.g. *S.*

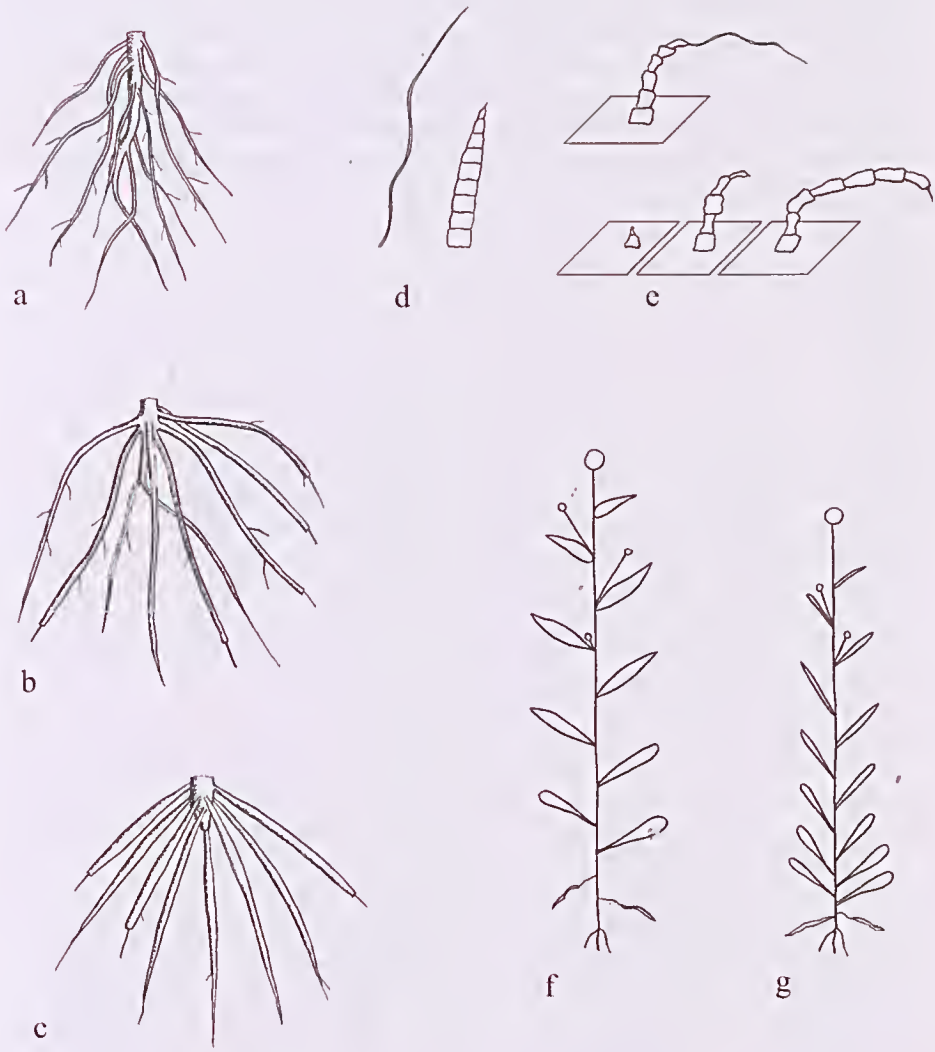

Figure 1. a–e. Root systems (× 0.5): a. Taproot well-developed, stouter than secondary roots (from *S. hispidulus*); b. Taproot slender, not stouter than fleshy secondary roots (from *S. phelleus*); c. Taproot slender or lost, secondary roots very fleshy and slightly tuberiform (from *S. prenanthoides*); d–e. Indumentum (× 30): d. hair types – fine and coarse, septate; e. coarse, septate hairs, showing variation in length and degree of wispy extension (hairs desiccated and variously collapsed and crumpled as seen in herbarium specimens); f–g. Habit (schematic): f. internode elongation progressive, leaves more or less evenly spaced and sized through middle third of stems (note also the trend in leaf shape: oblanceolate grading to lanceolate upwards); g. internode growth suppressed until near flowering period, leaves distinctly broader and more crowded in lower half of plant at flowering.

diaschides and *S. quadridentatus*, conspicuous, leafy, axillary shoots develop precociously below the inflorescence branches. *Senecio glabrescens* is unusual in having a dense, clumped appearance in its first season, becoming multistemmed from the base and with the primary stem much-branched in the lower half.

In most species, leaves are produced along a progressively elongating stem and at anthesis leafiness is fairly evenly distributed along the stem. However, in a few species, e.g. *S. prenanthoides*, *S. phelleus*, and *S. dolichocephalus*, stem elongation is somewhat suppressed for several months with a basal rosette developed, followed by a period of rapid elongation of stems. In these species, as flowering commences, the lower third of stems is distinctly leafier than the upper two-thirds.

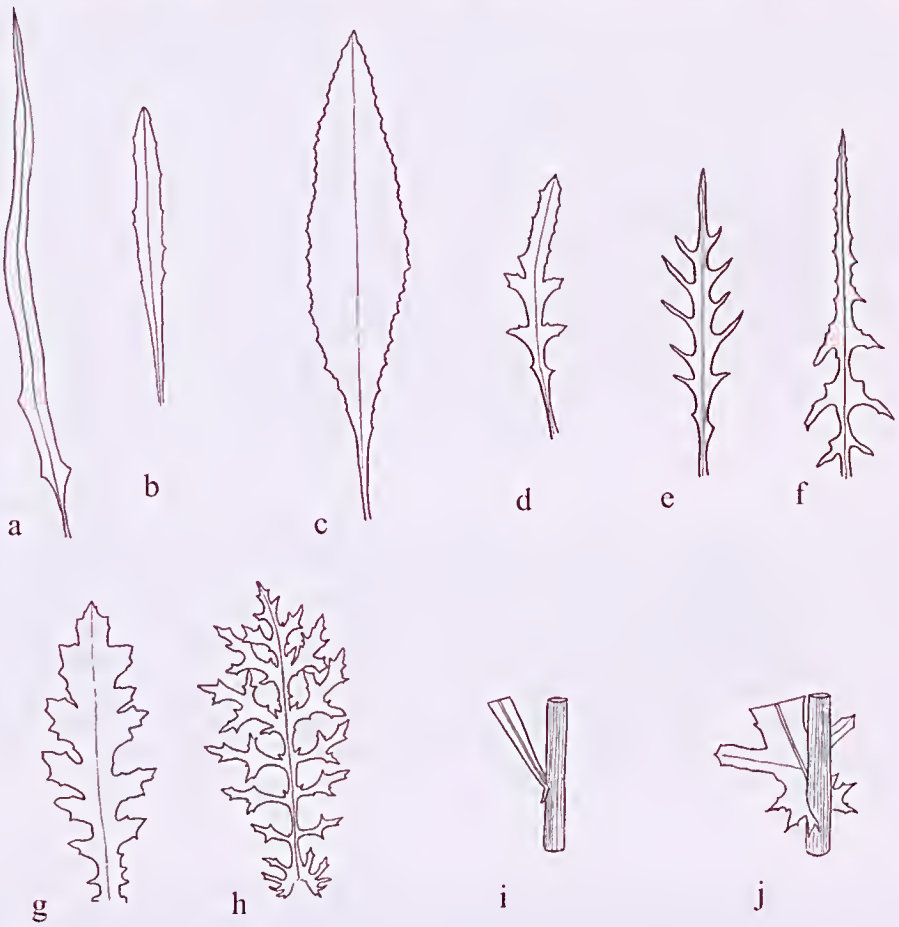

Figure 2. Examples of leaf variation (leaves from mid stem region x 0.5; basal auricles not included except in h.: a. undivided except for a few proximal lobes, margins entire (from *S. phelleus*); b. undissected, margin scattered-denticulate (from *S. prenanthoides*); c. undissected, margin crowded-denticulate (from *S. minimus*); d. coarse-dentate to deeply lobate, margin denticulate, segments and dentition proximal (from *S. hispidulus*); e. coarse-dentate to deeply lobate, margin entire (from *S. diaschides*); f. deeply lobate, segments retrorse (from *S. runcinifolius*); g. segments present along most of length, teeth on segments present in distal half (from *S. distalilobatus*). h. bipinnatisect (from *S. banhurstianus*); i. base of leaf showing small, entire auricles, non-amplexicaul (from upperstem leaf of *S. quadridentatus*); j. base of leaf showing large, dissected aurieles, somewhat amplexicaul (from *S. biserratus*).

Roots (Fig. 1): The primary root system is persistent as a single taproot or as a few-branched system, but the relative size of the primary roots compared to secondary roots is variable. In species such as *S. quadridentatus* and *S. hispidulus* the taproot is considerably stouter than the secondary roots which are rather fine and hardly fleshy. Conversely, in species such as *S. phellens* and *S. hispidissimus*, the taproot is slender and no stouter than the secondary roots which are distinctly fleshy (the cortex is enlarged) and generally unbranched except for occasional fine rootlets. Secondary roots of *S. prenanthoides* and *S. psilophyllus* become particularly fleshy and are characteristically slightly tuberiform.

Indumentum (Fig. 1): Hairs are of two types:

1. Coarse hairs. These hairs are comprised of 3–12 cells in one series arising at right-angles to the surface. They are visibly septate (the septa indicating cell boundaries) and transparent when fresh. In pressed herbarium specimens, these hairs are somewhat crumpled but the septa can still be discernible. They taper to a point or have a wispy extension. Relatively short hairs sometimes occur on leaves giving the surface a tubercular appearance. Excluding wispy extensions, hairs range from 0.2–2.0 mm long. When there is a wispy extension, a cobwebby or woolly layer may develop which may partially or totally obscure the coarser portion.
2. Fine hairs. These hairs are white and long and very fine (wispy) throughout with no cellular structure evident. Their diameter is about one-tenth of that of coarse hairs and are equivalent in form to the wispy extensions of the coarse hairs. Along stems fine hairs are typically arranged longitudinally and the term appressed-cottony describes this arrangement. Otherwise the hairs are somewhat tangled. The term cobwebby is used for loose tangles and woolly for dense tangles where the underlying surface is more or less completely obscured.

The indumentum of the lower stem region is important taxonomically. This is best examined before anthesis has progressed too long as hairs tend to be lost with age, although residual hairs can usually be identified microscopically. There are two main types of stem indumentum: coarse, spreading and appressed-cottony. The indumentum commonly changes along the stem either by a reduction in density, a transition from coarse hairs to fine e.g. in *S. glomeratus* subsp. *glomeratus*, or both. In species with an appressed-cottony indumentum, density commonly reduces upwards so that the upper stem region is more or less glabrous; however, in *S. quadridentatus* and usually also in *S. gunnii* the density tends to be maintained towards the summit. Species with particularly dense coarse spreading indumentum on their stems include *S. hispidissimus*, *S. bathurstianus* and *S. longipilus*.

Leaves (Fig. 2): Leaves are sessile, alternate, and thin to slightly coriaceous. The largest leaves of species vary from 6 to 30 cm long and the l:w ratio of these leaves varies from 2–40. There is considerable variation in dissection, development of basal auricles and indumentum. In all species there is some transition in leaf shape from lower stem region to upper stem region; in general there is a gradual shift in the broadest part of the leaf from the distal half to the proximal half and there is a gradual, or sometimes relatively rapid, reduction in leaf width upwards. Leaves in the lower third of stems are mostly oblanceolate or narrow spathulate, i.e. broadest distally, and the proximal portion is attenuate or petiole-like. Mid stem leaves are often similar in width but tend to narrow-elliptic; however, in some species, the mid stem leaves are markedly narrower than lower stem leaves. In this region the leaf-bases of many species are auriculate and amplexicaul (stem-clasping). The dissection of the auricles reflects the nature of the dissection of the main part of the lamina.

In the upper stem region internodes typically become longer, leaves become markedly smaller, and especially narrower so that the length:width ratio increases, and the broadest part of the leaf tends to be more basal. In species such as *S. picridioides* and *S. hispidulus* the upper stem leaves are commonly markedly lanceolate and the auricles are relatively large.

Leaves are often dissected and in this paper this means that the depth of incision (or sinus depth) is greater than 30% of the distance from leaf outline to midrib. The terms coarse-dentate, lobate and pinnatisect are used to describe the variation in depth (see glossary of terms below). Dissected leaves have 1 to 8 segments per side and the placement of segments along the leaf varies between species, e.g. those of *S. hispidulus* and *S. runcinifolius* do not typically extend into the distal third, whereas in *S. longipilus* they tend to be confined to the distal half and extend well into the distal third. Commonly there is a gradual reduction in the depth of dissection distally. There is some variation within species in terms of dissection. Several species can have either dissected or non-dissected leaves, and this is also influenced by environmental factors and the position of the leaf on the plant.

Smaller incursions towards the midrib (i.e. less than 30%) are treated here as dentition of the margin, and the number and frequency of callus-denticulations, denticulations or teeth of a leaf varies greatly between species (Fig. 2). *Senecio minimus* is a good example of a species with very frequent denticulations. The margin of primary segments can be entire, toothed, or sometimes themselves dissected (i.e. leaf bipinnatisect). The overall shape of segments is affected by the size, position and frequency of the marginal dentition, e.g. lobes of *S. glomeratus* subsp. *glomeratus* and *S. distalilobatus* are commonly roughly oblong or obovate due to the presence of a few relatively large teeth in the distal half of the segment, whereas lobes of *S. hispidulus* and *S. biserratus* are generally roughly triangular.

Margins are commonly narrowly recurved, but in some species they are more strongly recurved or revolute, e.g. in *S. macrocarpus* and *S. quadridentatus*. Upper stem leaves of many species are somewhat revolute, possibly partly an artifact of pressing, and marginal dentition and sometimes lobation may be hidden as a result.

The upper surface of leaves are variously green or grey-green, but sometimes this colour is obscured to some extent by appressed fine hairs. The lower surface is often green also, though commonly paler than the upper surface, or sometimes tinged with or intensely coloured purple. Leaves are glabrous on one or both surfaces or variously indumented with coarse or fine hairs or a mixture of the two. As with the stem indumentum, the indumentum of leaves typically undergoes a transition from lower leaves to upper leaves, with typically a reduction in the density of coarse hairs and sometimes with an increase in the density of fine hairs. The cobwebby indumentum on upper surfaces of some species tends to be short-lived. In some species with a coarse-hairy upper surface, the midrib of the lower surface is the same but the adjacent lamina is glabrous, e.g. *S. longipilus*, *S. macrocarpus* and forms of *S. squarrosus* and *S. multicaulis*.

Inflorescences (Fig. 3): Unit inflorescences are polychasial cymes or panicles of few to 50 or more capitula. Leafy upper stem branches commonly produce secondary inflorescences more or less at the same time as the primary inflorescence and the combined total of capitula may be several hundred. Sometimes development of leafy branches further down the stem occurs after the initial flowering period dependent on favourable conditions. The shape of inflorescences is sometimes roughly corymbiform, but is often somewhat irregularly broadly obconic with secondary inflorescences overtopping the primary inflorescence. The same phenomenon of overtopping usually occurs within an inflorescence where lateral capitula or clusters overtop their central counterparts due to longer lateral peduncles and panicle branchlets. Peduncles gradually increase in length prior to and during flowering. It is unclear at what point elongation ceases but there is no marked elongation as fruits mature. Species with larger capitula have fewer capitula on longer peduncles. Bases of peduncles and branchlets are subtended by bracts. Peduncles are bracteolate with 0–3(–5) scattered along the peduncle and 3–12 calyculer bracteoles inserted on or just below the receptacle, and typically more or less appressed around the base of involucre (divergent in *S. macrocarpus*). Bracteoles are narrow-ovate to narrow-lanceolate, 1–5 mm long, and variously purple or black-tipped. Peduncular bracteoles are not or hardly longer than calyculer bracteoles but in a

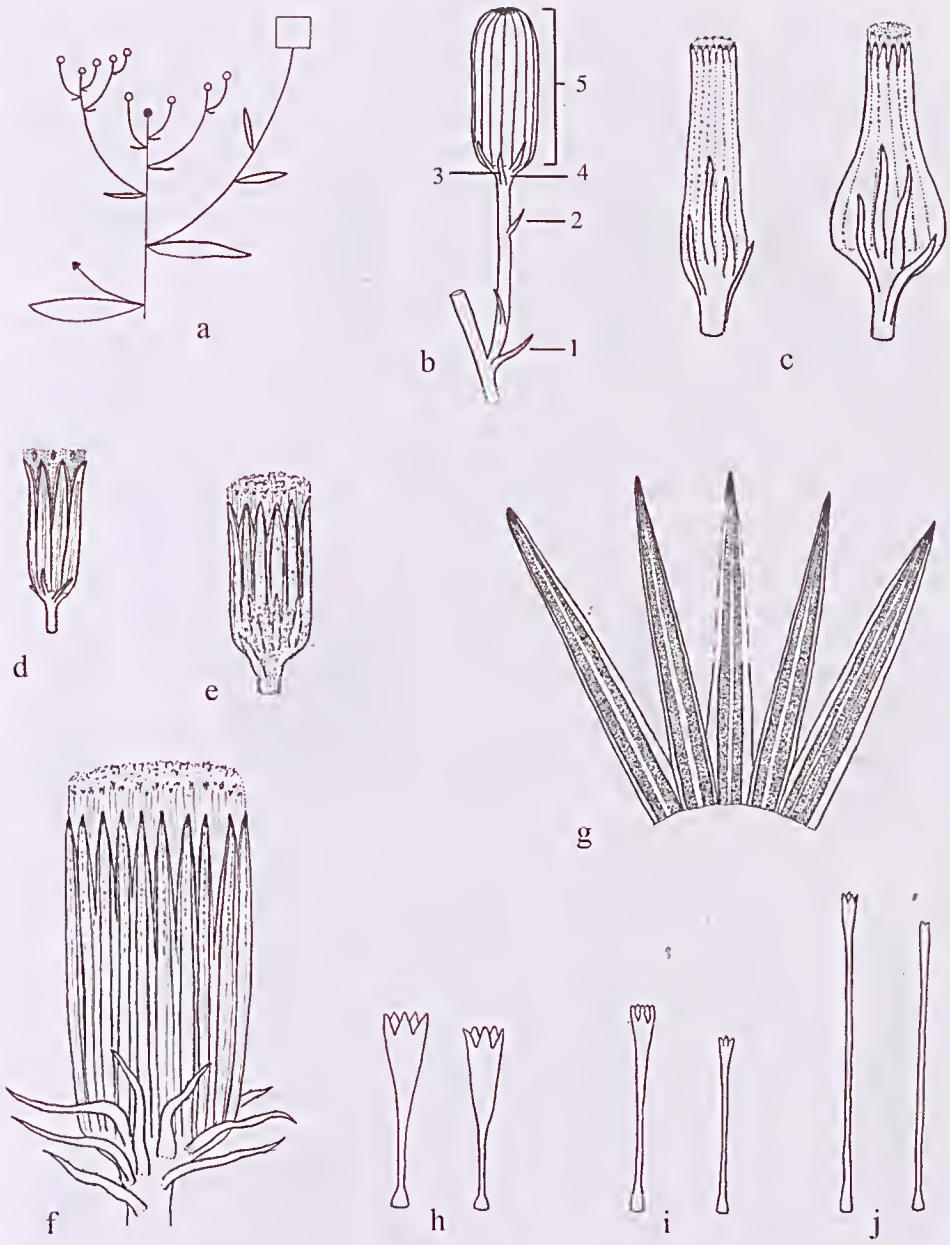

Figure 3. a. Inflorescence architecture: The primary unit inflorescence with capitula represented by circles and the initial capitulum shown as a closed circle. A secondary inflorescence, defined by presence of leaves, is also shown (cluster of capitula represented as a square). Moderate overtopping is demonstrated in this example; b. Capitulum and peduncle: 1. peduncular bract, 2. peduncular bracteole, 3. calycular bracteole, 4. receptacle, 5. involucre; c. Capitula: shape change through time: (l) just prior to anthesis, and (r) bulging basally towards fruit maturity. d–f. Capitula: major categories x 3 (examples drawn from pressed material): d. Involucres of c. 8 phyllaries (from *S. minimus*); e. Involucres of c. 13 phyllaries (from *S. glomeratus* subsp. *glomeratus*; note basal woolliness); f. Involucres of c. 20 phyllaries (from *S. macrocarpus*; note spreading calycular bracteoles in this species); g. Phyllary morphology: five consecutive phyllaries of an involucre demonstrating the three major types of phyllary. From r–l: inner (margin broad, stereome with two resin ducts); outer (margin narrow, stereome with one resin duct); inner (stereome with only one resin duct); outer; intermediate (margin narrow on one side, broad on other). h–j. Florets x 5: corollas of central (l) and marginal florets (r): h. a discoid species, *S. odoratus* Hornem.; i. *S. hispidulus*; j. *S. dolichocephalus*.

few species, notably *S. longipilus*, they are significantly longer. Peduncles, paniele branehlets and the margin of bracteoles are often woolly or cobwebby, or sometimes coarse-hairy, and this indumentum is variably persistent. In some speeies the indumentum evident at the bud stage of eapitular development is largely or entirely lost by anthesis, whereas in other speeies, e.g. *S. glomeratus*, the wool is more persistent. The indumentum evident around the base of capitula is predominantly due to the marginal hairs of the ealycular bracteoles. It is important to note that species identified as having glabrous peduneles and capitula frequently bear a few residual hair-bases on these margins (evident when inspected under moderate magnification).

Capitulum (Fig. 3): The eapitulum is comprised of the receptacle (the somewhat obconieal termination of the peduncle) and an involucre whieh surrounds the florets. Calycular braeteoles, deseribed in the previous section, could also be considered part of the capitulum. The involuere is eomprised of 7–25 phyllaries and is eylindrical or very slightly conical as florets emerge. The number of phyllaries is often relatively consistent within species with three main categories of phyllary number: a 7–9 phyllary category, a 12–14 phyllary category and a 16 or more phyllary eategory. A few species, e.g. *S. hispidulus* and *S. squarrosus*, appear to be elose to a borderline between categories and the number of phyllaries per involuere varies more widely in these speeies. Post-fertilisation, the involucre becomes strongly conieal in the basal half as fruits develop and in most speeies the receptacle broadens more or less equally to accommodate the developing fruits. In a few speeies, notably *S. glandulosus*, the reeeptaele does not broaden greatly and the involucre bulges distal to its insertion with the reeeptaele to accommodate the enlarging fruits.

The phyllaries are free, but with hyaline margins overlapping. They form a single series around the florets and are much more substantial structures than the ealycular bracteoles which are sometimes interpreted as an outer series of phyllaries in line with interpretations of equivalent structures in other tribes in the Asteraeeae. Phyllaries are very narrow-triangular or nearly linear and generally taper more strongly in the distal few millimetres. They are composed of a central green or purple stereome and a eolourless hyaline margin. The stereomes are of variable thickness and eonvexity and, in dried specimens, have one or two slightly to strongly reeessed longitudinal resin ducts. Hyaline margins strongly overlap and in the natural position at anthesis are largely hidden. Three phyllary types are reeognised: outer phyllaries (stereomes narrow and with one duet, hyaline margin narrow and overlapping to the outside of margin of adjacent inner phyllaries) largely alternate with inner phyllaries (stereomes of varying width and with one or two ducts, margin broad). This alternation is imperfeet however, as the third phyllary type, which is a hybrid of the outer and inner types is frequently also present (Fig. 3g).

The apex of phyllaries is eiliate and the tip, the distal most 0.2–0.5 mm, is typically pigmented black or brown, or less often purple. In many species a zone 0.5–1.5 mm long below the tip is pale to medium purple. In most species the apex is more or less erect at flowering, but in a few species, e.g. *S. squarrosus* and *S. interpositus*, the narrower distal portion is quite distorted and variably reflexed or squarrose.

Following ripening of fruit, the phyllaries beeome brown and adopt a charaeteristic orientation. Further work needs to be done to eharacterise this in eaeh species. For example, in *S. glomeratus* and *S. hispidulus* the phyllaries are ereet or inturned, whereas in *S. quadridentatus* the phyllaries are spreading to reflexed.

Florets (Fig. 3): Bisexual florets are central and are surrounded by a (usually) greater number of female florets. Female florets usually outnumber bisexual ones by a factor of two or three, but the ratio is nearer to one in *S. interpositus*. The demarcation between floret types is fairly clear but a few florets intermediate in morphology may be present. Corollas of florets range in length from 3 to 13 mm and are generally no more than 1 mm wide at the summit. Corollas of female florets are relatively reduced; they are on average c. 1 mm

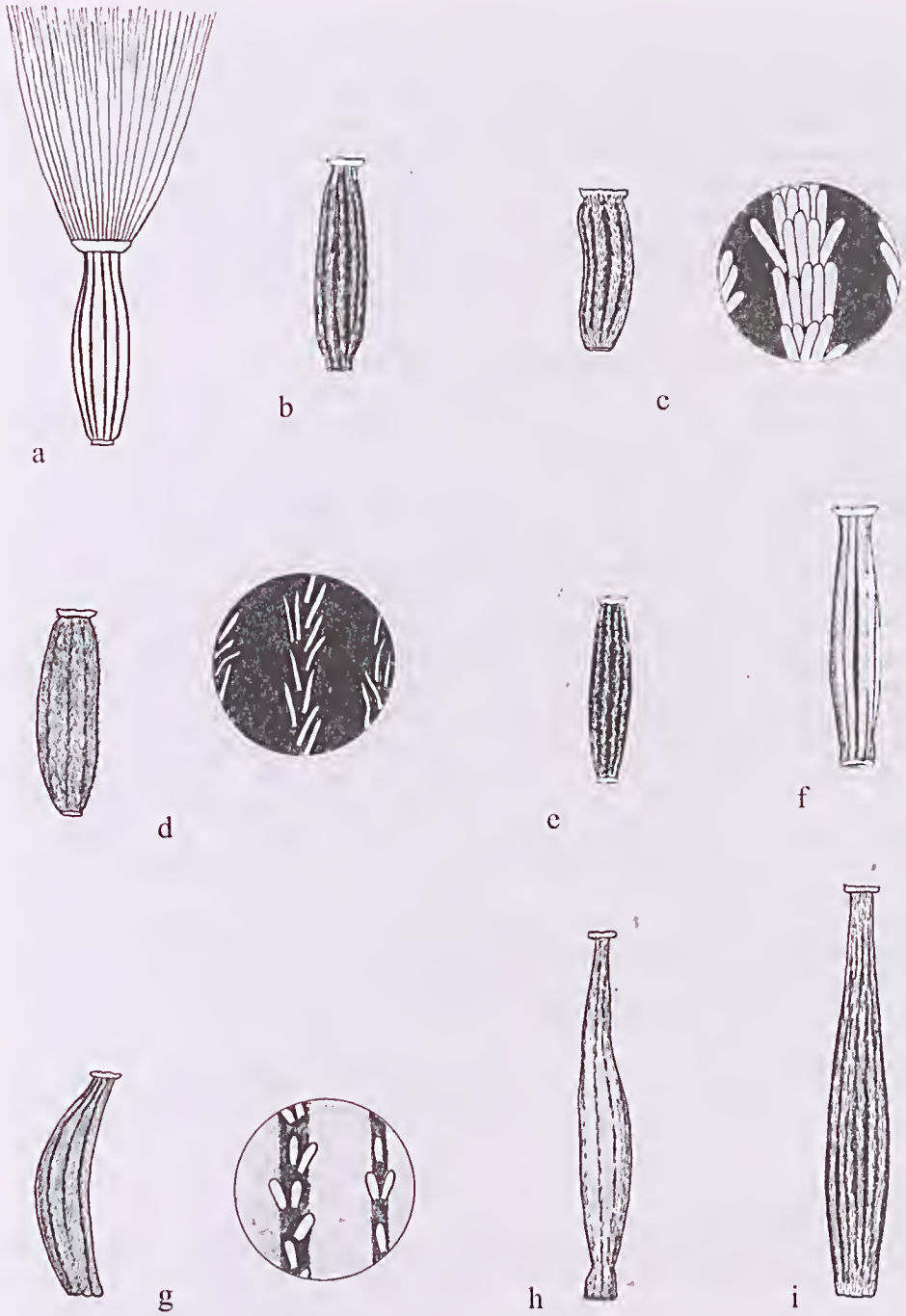

Figure 4. Achenes (x 10; close-up of papillose hairs x 40). a. General morphology showing carpopodium, body with longitudinal ribs, pappus ring and pappus; b. *S. phelleus* (*A.C. Beauglehole 22142* MEL); c. *S. multicaulis* subsp. *nudticaulis* including close-up of dense bands of papillose hairs (*G. Keighery 11693* PERTH); d. *S. distalilobatus* including close-up of narrow bands of rather fine papillose hairs (*J.H. Willis* MEL); e. *S. biserratus* (*A.C. Beauglehole 62777* MEL); f. *S. niveoplanus* (*I.R. Thompson 758* MEL); g. *S. glandulosus* including close-up of lines of short papillose hairs (*I.R. Thompson 754* MEL); h. *S. longicollaris* (*I.R. Thompson 704* MEL); i. *S. macrocarpus* (*B. Kemp s.n.* MEL).

shorter than the bisexual florets, the limb of their corolla is narrower, and the corolla-lobes are sometimes fewer and shorter. Bisexual florets have 4- or 5-lobed corollas whereas female florets have 2–4(–5)-lobed corollas with, the number often being one or two fewer than the bisexual florets in the same capitulum. The length of corolla-lobes varies subtly between species and in some species, e.g. *S. quadridentatus* and *S. queenslandicus* the corolla-limb is barely broader than the tube and lobes are barely developed. The thickness of apex of corolla-lobes also varies subtly and appears to be fairly consistent within species, e.g. the corolla-lobes of *S. longipilus* and *S. phelleus* are strongly thickened apically, whereas those of *S. quadridentatus* are hardly thickened. Some differences in the colour of the corolla-limb have been observed; in some species the disc is yellow-green but in *S. glomeratus* and *S. runcinifolius* it is yellow, and in *S. squarrosus* it is often purple. Further observation is necessary to fully evaluate this character.

Achenes (Fig. 4): Achenes range in length from 1–7 mm, and their shape varies from obloid to narrowly ellipsoid to very narrowly lageniform with necks of various lengths and slenderness. In a few species, e.g. *S. glomeratus* subsp. *glomeratus* the achene is slightly narrower basally. The carpopodium is variously exserted or recessed; e.g. typically exserted in *S. glomeratus* but recessed in *S. prenanthoides*. The body of the achene is longitudinally ribbed. Ribs are narrow to broad, 6–10 in number and flat to convex; those of *S. tenuiflorus* are perhaps the most distinctly convex. The colour of the ribs varies; red-brown, brown, orange-brown, olive-brown, olive, and green have been recorded, and the surface varies from dull to lustrous. Colour can be variable within a single capitulum. Simple white or slightly translucent papillose hairs are present on the achene in most species and usually arise along the grooves between ribs to form longitudinal lines or bands of various width and density. They are termed papillose because they are short and have a rounded apex. Sometimes the distribution of hairs is more or less diffuse. The hairs are predominantly antrorse and appressed, although sometimes they are slightly divergent laterally and/or vertically. In most species the diameter of the hairs is similar but length varies somewhat and the length:width ratio ranges from 1–6. In most species with lageniform achenes the hairs are short (l:w ratio of 1–2) and arranged in narrow lines.

A pappus ring crowns the summit of the achene. Bristles arise from this ring and are fine and superficially smooth but are generally minutely and somewhat sparsely scabrid-barbellate. The pappus is not persistent and mostly is approximately the same length as the corolla, although in *S. longipilus* it typically exceeds the corolla.

Phenology: The main flowering period for most species is in spring or summer. It appears to be autumn for *S. psilophyllus*. In many species, flowering can also occur sporadically at other times of the year. Fruits mature approximately two months after flowering.

Chromosomal Studies

Lawrence (1980) obtained chromosome numbers of n = 30, n = 20 and n = 50 for ten named and several informal disciform species (see Index of Scientific Names for details and correspondence with current names). Strong congruence is evident between the numbers of n = 20 and 30 and the achenial morphology elucidated in this paper. The nine species with n = 30 have achenes that are obloid to narrow-obloid or oblong-ellipsoid with a poorly developed neck, and with hairs of l:w ratio c. 4–5 that form moderately dense bands. The three species with n = 20 have achenes that are very narrow oblong-ellipsoid or narrowly lageniform with a well-developed slender neck, and with hairs of l:w ratio c. 1–3 that are generally fewer and less crowded. The count of n = 50 for *S. biserratus* and *S. distalilobatus* (both as *S. biserratus* in Lawrence's paper) needs further investigation. There seems to be no particular morphological features that set these two species apart.

It is also noteworthy that the gametic chromosome number is 30 for the discoid species of *Senecio* and for the related small-headed radiate species *S. linearifolius* A.Rich. and *S. garlandii* F.Muell. ex Belcher (The Odoratus group of Thompson 2004). Morphologically the disciform group appears to be most closely related to the Odoratus group and the correspondence in chromosome number adds support to the contention that the groups are closely related. Gametic chromosome counts of 20 were obtained by Lawrence for several radiate species of *Senecio*, e.g. *S. lautus* Forst.f. ex Willd. *sensu lato*, *S. gregorii* F.Muell. and *S. magnificus* F.Muell. In this instance, however, morphological correspondence between species and the disciform species with n = 20 is lacking, and the independent evolution of this chromosome number is considered more likely.

Glossary of some terms used in keys and descriptions

Appressed-cottony: Having an indumentum of fine hairs arranged longitudinally along and closely appressed to stems

Calycular bracteoles: Those bracteoles clustered around the base of the capitulum. They arise on or a short distance below the receptacle of the capitulum with the greater part of the structure extending at least onto the receptacle.

Coarse hairs: coarse, septate, spreading hairs of varying length (see Fig. 1d–e). Coarse-hairy means having an indumentum containing these hairs.

Cobwebby: Bearing an indumentum of tangled fine hairs (or long fine extensions of coarse hairs) that only partially obscures the underlying structures

Dissection of leaves: Leaves are considered to be dissected if the % distance that the sinuses extend from margin to midrib is > 30% (includes coarse-dentate, c. 30–50%; lobate, c. 50–75%, and pinnatisect, > 75%). Coarse teeth, lobes and pinnatisect segments of such dissected leaves have sometimes been given the general term 'segments' for simplicity.

Fine hairs: Thread-like hairs that are approximately 10% of the diameter of coarse hairs with no visible internal structure.

Involucral diameter: This is based on measurement of fresh material approximately 2/3 of the distance along the involucre from base. At this point the diameter is more or less constant through the phases of development of the capitulum (the lower half of the involucre often expands substantially after fertilisation to accommodate developing fruits (see Fig. 3c) and the diameter of the apex can be affected by reflexion of the phyllaries). In pressed specimens the involucre is variably flattened, which increases the diameter by up to 50% so, if capitula are squashed by the pressing process, allowance needs to be made for this.

Lageniform: (of achenes) means bottle-shaped, i.e. the distal third is narrower and is more tapered than the proximal third (see Fig. 4g–i).

Lateral peduncle: Peduncle that arises from the ultimate bract of a flowering axis as distinct from the usually shorter central peduncle (see Fig. 3a).

Leaves: Unless indicated otherwise in the keys, 'leaves' refers to those leaves arising from the middle third of stems (i.e. not branch leaves or uppermost or lowermost leaves).

Overtopping: In inflorescences, where a single lateral capitulum or a lateral cluster extends above the adjacent central capitulum or central cluster. This architecture is common among the disciform species.

Scabridulous: of a surface with rather short, coarse hairs that resemble tubercles in pressed specimens.

Segments: General term used for dissected leaves to denote coarse teeth, lobes or pinnate segments.

Unit inflorescence: A terminal cluster of capitula where all the branches supporting the capitula are leafless (see Fig. 3a).

Woolly: Bearing a dense indumentum of tangled fine hairs (or long, fine extensions of coarse hairs) such that the underlying structures are more or less completely obscured.

Taxonomy

The Australian Disciform species of *Senecio*

Short-lived perennial herbs, sometimes weakly shrubby, sometimes annual, never glaucous. *Taproot* weak to stout; secondary roots fibrous or fleshy, 0.5–2.5 mm diam., hardly branched, rarely mildly tuberiform. *Rootstock* short, rarely shortly rhizomatous. *Indumentum* often present on some or all of stems, leaves, inflorescence branchlets, peduncles, margin of bracteoles, and capitula; hairs coarse, spreading, to 2 mm long, with or without wispy extensions, or entirely wispy, and then longitudinally disposed (cottony) or tangled (cobwebby or woolly). *Leaves* thin to slightly coriaceous, variously dissected or lacking dissection; margin entire, denticulate, dentate or serrate; base auriculate or not; lower surface sometimes purple. *Inflorescence* a pleiochasial cyme or panicle, corymbiform to often obconical due to overtopping, capitula per unit inflorescence 1 to many. *Capitula* disciform, heterogamous; calycular bracteoles 2–12, narrow-ovate, lanceolate or linear, 1–6 mm long; involucre 3–13 mm long, 1–5 mm diam.; phyllaries 7–25, free; stereome green or purplish, glabrous or cobwebby, flat or convex, with generally pale resin ducts. *Florets* 12–100, with female florets more numerous, surrounding bisexual florets, or rarely all florets bisexual; corollas 3–13 mm long, those of bisexual florets with limb weakly dilated, 0.5–1 mm diam. at summit, those of female florets with limb barely dilated, 0.2–0.4 mm diam. at summit. *Achenes* homomorphic, obloid to narrow-obloid, obloid-elliptic, or very narrowly lageniform, 1–7 mm long, green, olive, tan, red-brown or dark brown, ribs nearly flat to convex; papillose hairs in sparse to dense longitudinal lines or bands more or less following the grooves between ribs, uncommonly somewhat dispersed, or absent; carpopodium c. 1/3–1/2 the diameter of body, exserted or not. *Pappus* caducous; bristles fine, sparsely and minutely scabrid-barbellate.

KEY

1 Leaves deeply dissected (deeply lobate to pinnatisect) with segments of all or most leaves somewhat retrorse, or leaves deeply pinnatisect or bipinnatisect with segments arising distal to as well as proximal to midleaf and upper stem leaves mostly also pinnatisect
  2 Leaf segments retrorse; involucre 7.0–11.0 mm long ..... **15. *S. runciniifolius***
  2: Leaf segments not retrorse; involucre 3.5–7.0 mm long
    3 Stems ±glabrous; involucre length 3–4 times the diameter; phyllaries predominantly c. 8–10 ..... **5. *S. bipinnatisectus***
    3: Stems sparsely to densely coarse-hairy; involucre length 2–3 times the diameter; phyllaries predominantly c. 12–14
      4 Leaves coarse-hairy; achenes 1.5–2.0 mm long, with papillose hairs scattered ..... **8. *S. bathurstianus***
      4: Leaves glabrous; achenes 2.0–2.7 mm long, with papillose hairs in bands. ..... **7. *S. brevitubulus***

1: Leaves not dissected deeper than deeply lobate, with segments not retrorse, or if ever pinnatisect then segments only arising in proximal half of leaf and upper stem leaves usually not pinnatisect
  5 All or most involucres in an inflorescence comprising 7–13 phyllaries and florets per capitulum ≤ 25 (involucral diameter, as defined in glossary, up to 1.5 mm)
    6 Plants lacking coarse hairs; stems densely appressed-cottony for most of length and lower surface of leaves woolly ..... **19. *S. quadridentatus***
    6: Plants with coarse hairs (sometimes short and tubercle-like) on stems and/or leaves (close inspection required), or if not, then stems not appressed-cottony for most of length and lower surface of leaves not woolly
      7 Upper stem leaves densely scabridulous (coarse hairs short) on upper surface, woolly on lower surface, the wool overlying coarse basal portion

of hairs (far eastern Australia around Queensland-New South Wales border).....**25. *S. scabrellus***

7: Upper stem leaves not as above

8 Leaves surfaces glabrous or nearly so (margin may have some hairs)

9 Plants erect; taproot well-developed; leafy axillary growth conspicuous in axils above mid stem as flowering commences; leaves often with narrow-triangular lobes; phyllaries 4.5–6.5 mm long; achenes oblong-ellipsoid (riparian).....**2. *S. diaschides***

9: Plants sprawling; taproot inconspicuous; stem slender; leafy axillary growth not present or inconspicuous as flowering commences; leaves not divided, sometimes remote-dentate; phyllaries 6.0–8.0 mm long; achenes narrowly lageniform (not riparian) ....**30. *S. psilophyllus***

8: Leaves with hairs on one or both surfaces

10 Leaves not dissected, or if ever with segments then only 1 or 2 developed per side in proximal half; upper stem leaves usually with a l:w ratio > 10; base of leaves above mid stem not or hardly amplexicaul, with auricles lacking or triangular and entire.

11 Secondary roots fleshy and usually slightly tuberiform; lower stem bearing spreading coarse hairs; achenes narrowly lageniform, 2.8–4.0 mm long .....**29. *S. prenanthoides***

11: Secondary roots slightly to moderately fleshy but not tuberiform; lower stem appressed-cottony or near glabrous, stem not developing coarse hairs; achenes not or indistinctly lageniform, 2.0–2.8 mm long

12 Leaves sometimes remotely lobate; ribs of achenes convex, with papillose hairs sparse in narrow grooves (New South Wales and Queensland, north from Sydney region) ....**26. *S. tenuiflorus***

12: Leaves never dissected; ribs of achenes flat to slightly convex, papillose hairs crowded in grooves (south-eastern Australia largely south of Sydney) .....**24. *S. microbasis***

10: Leaves regularly dissected, with 3–6 segments per side extending into distal half, or not dissected but then margin crowded-denticulate; upper stem leaves with a l:w ratio < 10; base of leaves above mid stem somewhat amplexicaul, with auricles well-developed, variously shaped and usually toothed or lobed

13 Coarse hairs rather sparse; leaves usually not dissected, with sinuses typically < 25% of distance to midrib; phyllaries 7–10 . .....**1. *S. minimus***

13: Coarse hairs scattered to moderately dense; leaves dissected; phyllaries 7–13

14 Stems and lower surface of leaves often intensely purple; segments of leaves roughly semicircular and with margin crowded-denticulate; uppermost leaves clearly broadest at auricles.....**4. *S. picridioides***

14: Stems and lower surface of leaves mostly green, sometimes slightly to moderately purple; segments of leaves not as above; uppermost leaves broadest at auricles or not

15 Mid to upper stem leaves with coarse hairs on both surfaces, cobwebby overlay not conspicuous; phyllaries predominantly 11–13, or if rarely predominantly 9–10 then achenes red-brown, < 2.2 mm long, and

segmentation of mid to upper stem leaves confined to proximal two-thirds.

16 Lower half of stems sparsely to moderately coarse-haired, coarse hairs rather sparse above mid stem; apex of phyllaries with a small black spot < 0.5 mm long; achenes red-brown .....**9. *S. hispidulus***

16: Lower half of stems densely coarse-haired, coarse hairs usually frequent in upper stem region and present on inflorescence branches; apex of phyllaries marked with a purple zone c. 1 mm long; achenes tan or chocolate-brown.....**10. *S. hispidissimus***

15: Mid to upper stem leaves as above or one or both surfaces ±glabrous or with a conspicuous cobwebby overlay; phyllaries predominantly 8–10, or if sometimes predominantly 11 or 12 then achenes 3–4 mm long, pale olive-brown, glabrous

17 Leaves with roughly triangular segments restricted to proximal 50–60% of leaf; achenes 3.0–4.0 mm long, pale olive-brown, glabrous .....**28. *S. niveoplanus***

17: Leaves with triangular, oblong or obovate segments and dissection extending into distal third of leaf; achenes 2.0–3.0 mm long, brown and with papillose hairs or red-brown with very fine papillose hairs

18 Primary roots inconspicuous; secondary roots fleshy; leaves with the continuous medial band of lamina (see fig. 2) roughly oblong and the distal centimetre of leaves commonly with an oblong section 2–8 mm long; achenes with a l:w ratio of c. 4–5, reddish-brown, with fine hairs in lines or somewhat scattered (montane).....**6. *S. distalilobatus***

18: Primary root well-developed; secondary roots not fleshy; leaves with the continuous medial band of lamina somewhat elliptic and the distal em of leaves roughly triangular; achenes with a l:w ratio of c. 6–7, brown, with plump papillose hairs crowded in bands (coastal or occasionally montane).....**3. *S. biserratus***

5: All or most involucres comprising 11–25 phyllaries and florets per capitulum > 25 (involucral diameter up to 5 mm)

19 Stems bearing coarse spreading hairs (sometimes partly obscured by overlying wispy extensions), sometimes only in lower stem region and tending to be lost with age

20 Secondary roots distinctly fleshy, commonly slightly tuberiform; achenes narrowly lageniform, 2.8–4.5 mm long, with papillose hairs short (l:w ratio 1–2), and sparse to scattered in lines narrower than the ribs .....**29. *S. prenanthoides***

20: Secondary roots fleshy or not, not tuberiform; achenes 1.0–3.0 mm long, obloid, oblong-ellipsoid, or if ever slightly lageniform then papillose hairs longer than above, (l:w ratio c. 3–4), forming dense bands as broad as the ribs

21 Phyllaries 3.0–6.5 mm long, involucral diameter < 2.0 mm; achenes with papillose hairs forming lines or bands 1–3 hairs wide, hairs scattered to moderately crowded

22 Peduncles and calycular bracteoles, and often lower surface of upper stem leaves, cobwebby to woolly at anthesis; calycular bracteoles 6–12; phyllaries green or purple .....**12. *S. gloueratus***

22: Peduncles and calycular bracteoles ±glabrous at anthesis, lower surface of leaves never cobwebby or woolly; calycular bracteoles 4–6; phyllaries green (except for minute blackish tips).....**9. *S. hispidulus***

21: Phyllaries 4.0–12.0 mm long, involucral diameter > 2.0 mm; achenes with papillose hairs forming dense bands 4–6 hairs wide

23 Leaves and inflorescence bracts bearing numerous coarse hairs, 0.5–2.0 mm long on upper surface and along midrib of lower surface, but remainder of lower surface glabrous (or a few hairs present along major veins); upper stem leaves not auriculate; phyllaries usually c. 13

24 Leaves with segments arising in distal two-thirds; involucre 9–10 mm long, length:diam. ratio c. 3; apex of phyllaries strongly recurved (Western Australia).....**34. *S. oldfieldii***

24: Leaves with segments arising in distal half; involucre 5–8 mm long, length:diam. ratio c. 2; apex of phyllaries not or only slightly recurved (New South Wales, Tasmania).....**33. *S. lougipilus***

23: Leaves and inflorescence bracts lacking coarse hairs or hairs generally 0.1–0.7 mm long and/or lower surface bearing coarse hairs; upper stem leaves auriculate or not; phyllaries 13–20

25 Involucral diameter > 2.5 mm; phyllaries commonly c. 20, sometimes c. 13; auricles not developed or small and entire or nearly so; ribs of achenes commonly blackish-brown .....**36. *S. squarrosus***

25: Involucral diameter < 2.5 mm; phyllaries commonly c. 13; auricles various; ribs of achenes tan, brown, or blackish-brown

26 Base of leaves above mid stem not or rarely auriculate, not amplexicaul; apex of phyllaries with a large black mark, purple zone absent; achenes slightly and narrowly lageniform, 2.5–3.0 mm long.....**32. *S. uigrapicus***

26: Base of leaves above mid stem usually auriculate and at least slightly amplexicaul; apex of phyllaries with a small black mark and often with a purple zone below it c. 1 mm long; achenes narrow-obloid, 1.5–2.5 mm long

27 Taproot inconspicuous, not stouter than secondary roots; leaves often with more than 3 segments per side; lower surface of leaves green; both surfaces of all leaves moderately to densely coarse-hairy; achenes tan to mid brown (eastern South Australia, Victoria, Tasmania).....**10. *S. hispidissiuus***

27: Taproot conspicuous, much stouter than secondary roots; leaves often with 3 or fewer segments per side; lower surface of leaves commonly intensely purple; leaves not entirely as above; achenes dark red-brown or brown (south-western Western Australia).....**11. *S. uulticaulis***

19: Stems not developing coarse hairs

28 Florets homogamous, bisexual; corolla-limbs homomorphic, 5-lobed; apex of phyllaries usually strongly reflexed at anthesis

29 Leaves glabrous (northern New South Wales).....**38. *S. iuterpositus***

29: Leaves densely woolly on one or both surfaces

30 Leaves densely woolly on both surfaecs; infloreseence branehlets, peduneles and braets densely woolly; calycular braetcoles > 4 mm long (western Victoria and south-eastern South Australia) .... **40. *S. helichrysoides***

30: Leaves densely woolly on lower surfaee only, inflorescenee branehlets, peduncles and bracts sparsely woolly; ealyeular bracteoles < 4 mm long (Central and Southern Tablelands of New South Wales, or subalpine regions in Victoria and Tasmania) .... **39. *S. georgianus***

28: Florets heterogamous, outer series female surrounding a smaller number of bisexual florets; eorolla-limbs of female florets with a narrower limb and often with fewer lobes than the inner bisexual florets; apex of phyllaries usually not strongly reflexed at anthesis

31 Plants glabrous or nearly so on all parts; leaves elliptic, with a l:w ratio of e. 2–4, often lobed; margin of leaves denticulate or dentate, with apex of lobes and teeth acuminate; involucre 4.0–5.0 mm long (Northern Territory, South Australia from Flinders Ranges northward) ..... **14. *S. laceratus***

31: Plants variously hairy or nearly glabrous; leaves not entirely as above; involuere > 5.0 mm long

32 Achenes narrowly lageniform, 2.5–7.0 mm long, or if smaller and not lageniform then stems densely appressed-cottony or woolly throughout

33 Stems creeping before arching to erect; leaves in basal third of stem to 8 em long, markedly broader than mid stem leaves; lower surface of leaves green, lacking coarse hairs and nearly glabrous (sub-alpine) ..... **31. *S. lageniformis***

33: Stems ±ereet from base; leaves in basal third of stem not entirely as above; lowland to montane

34 Unit infloreseences of < 10 capitula; a majority of involucres > 3.0 mm diam.; calycular bracteoles > 3.0 mm long, commonly divergent; achenes with papillose hairs in bands covering > 40% of surface, l:w ratio of hairs e. 4..... ..... **37. *S. macrocarpus***

34: Unit inflorescences of > 5 capitula; involucre < 3.0 mm diam.; calyeular bracteoles < 3.0 mm long, appressed; achenes with papillose hairs in lines or bands covering < 40% of surface, l:w ratio of hairs e. 1–2

35 Plants multi-stemmed and much-branched in lower half in its first season; primary stem with 5 to 10 leaves; stem leaves with bidentate auricles ..... **19. *S. glabrescens***

35: Plants usually not both multistemmed and branched in lower half in its first season; primary stem leaves 5 to many; stem leaves with aurieles absent or present only above mid stem and then small, triangular, entire

36 Plants commonly < 0.5 m tall; leaves often relatively crowded basally; mid stem leaves up to 7 mm wide; peduncles, bracteoles and phyllaries ±glabrous at anthesis (margin of bracteoles may be minutely ciliate); stems and leaves not densely indumented above mid stem

37 Phyllaries 6–8 mm long (northern New South Wales; southern Queensland) .... **22. *S. queenslandicus***

37: Phyllaries 8–12 mm long (South Australia; Victoria; Tasmania)
38 Capitula per stem < 15; achenes 5–7 mm long, markedly lageniform with a very long slender neck (Tasmania).....**17. *S. tasmanicus***
38: Capitula per stem typically > 15; achenes 3–4 mm long, only slightly lageniform (mainland Australia).....**21. *S. dolichocephalus***
36: Plant often > 0.5 m tall; leaves not generally crowded basally; mid stem leaves very narrow or up to 35 mm wide; peduncles, bracteoles and sometimes phyllaries cobwebby to woolly at anthesis, or if not then stems and lower surface of leaves densely indumented above mid stem
39 Taproot well-developed; secondary roots hardly fleshy; stems moderately to densely appressed-cottony or woolly (sometimes glabrescent with age); mid stem leaves narrow-linear, l:w ratio > 20 .....**20. *S. quadridentatus***
39: Taproot slender, inconspicuous; secondary roots fleshy; stems glabrous or only sparsely cottony; mid stem leaves very narrow-elliptic to linear (usually distinctly tapering to each end), l:w ratio < 20
40 Mid stem leaves < 15 mm wide, l:w ratio > 15; lower surface of leaves lacking coarse hairs; involucre 5–8 mm long; achenes 2.5–4.5 mm long.....**18. *S. glandulosus***
40: Mid stem leaves > 15 mm wide, l:w ratio < 10; lower surface of leaves frequently with short coarse hairs; involucre 7–9 mm long; achenes 4–6 mm long.....**16. *S. lougicollaris***
32: Achenes obloid or oblong-ellipsoid, 1.5–3.0 mm long, stems not densely appressed-cottony or woolly throughout
41 Apex of phyllaries strongly recurved at anthesis; c. 1/2 of florets bisexual; achenes pale tan to light brown, with papillose hairs in lines covering c. 1/5 of surface .....**38. *S. interpositus***
41: Apex of phyllaries not recurved at anthesis; c. 1/3–1/4 of florets bisexual; achenes olive-brown, brown–dark brown, orange or reddish, glabrous or with papillose hairs very sparse or in bands covering up to 2/3 of surface
42 Achenes glabrous or with papillose hairs few in lines within narrow grooves
43 Leaves with l:w ratio < 10 (montane to alpine)
44 Calycular bracteoles 2–3.5 mm long, not extending to midpoint of involucre; achenes > 2.5 mm long, olive-brown, usually with a few papillose hairs ....**27. *S. guuuii***
44: Calycular bracteoles 3–5 mm long, typically extending beyond the midpoint of involucre; achenes < 2.5 mm long, red-brown, glabrous ....**13. *S. exteusus***
43: Leaves with l:w ratio > 10 (lowland or hills or sometimes montane)

45 Plants of swamps, commonly growing in water; leaves glabrous or inconspicuously scabridulous on upper surface; length of involucre c. 2.5 times the diameter; achenes glabrous, with ribs flat and grooves hardly recessed (South Australia, Victoria, Tasmania) .....**35. *S. psilocarpus***

45: Plants typically not growing in water; leaves with coarse hairs, scabridulous, and/or cobwebby; length of involucre c. 4 times the diameter; achenes glabrous or sparsely hairy, with convex ribs and deep grooves (central New South Wales to southern Queensland) .. ..**26. *S. tenuiflorus***

42: Achenes with papillose hairs in somewhat dense bands covering c. 1/4–2/3 of surface

46 Base of mid to upper stem leaves often somewhat sagittately auriculate and somewhat amplexicaul; calycular bracteoles 3–5; involucral diameter < 2.0 mm. .....**23. *S. phelleus***

46: Base of mid to upper stem leaves not sagittately auriculate, not or only weakly amplexicaul; calycular bracteoles 6–10; involucral diameter > 2.0 mm.

47 Taproot slender, inconspicuous; involucre 6–11 mm long; phyllaries (12–)15–25 (southern Australia east of 119° longitude).....**36. *S. squarrosus***

47: Taproot usually well-developed; involucre 5–8 mm long; phyllaries 12–14(–16) (south-western Western Australia west of 119° longitude) ..**11. *S. multicaulis***

1. *Senecio minimus* Poir., in J.B.A.P. de Monnet Lamarck, *Encycl. Meth. Bot. Suppl.* 5: 130 (1817)

Erechtites minima (Poir.) DC., *Prodr.* 6: 437 (1838).

Type: Nouvelle-Hollande [Australia], *J.J.H. de Labillardière*; holo: FI; fragment of holo: P, *fide* R.O. Belcher, *Ann. Missouri Bot. Gard.* 43: 46 (1956).

E. pumila DC., *Prodr.* 6: 297 (1838). Type: 'in Nova Hollandia' [Australia], *J.J.H. de Labillardière*; holo: G (microfiche seen MEL), *fide* R.O. Belcher, *loc. cit.* [De Candolle stated that this species was based on *Senecio pumilus* Poir.: however, this name apparently was never published].

E. prenanthoides DC., *Prodr.* 6: 296 (1838); G. Bentham, *Fl. Austral.* 3: 658 (1867), *p.p.*; *E. labillardierei* Hieron., *Engl. Bot. Jahr.* 29: 63 (1900), *nom. illeg. superfl.*, as *Labillardieri*. Type: in Nova Hollandia [Australia], *J.J.H. de Labillardiere*; holo: G, *fide* R.O. Belcher, *loc. cit.*, microfiche seen at MEL.

S. muelleri Regel, *Ind. Sem. Hort. Bot. Imp. Petrop.* 31 (1863), as *Mülleri*. Type: 'semina cast nova Hollandia australia nobis communicavit' [seed sent from Australia], *F. Mueller*; *fide* R.O. Belcher, *loc. cit.*

S. heterophyllus Colenso, *Trans. N.Z. Inst.* 27: 389 (1894), as *heterophylla*. Type: *fide* R.O. Belcher, *loc. cit.*

Herbs to 2 m high. *Primary roots* well-developed; secondary roots fine, c. 0.5 mm diam. *Stems* erect, sparsely and minutely coarse-hairy below mid stem reducing to glabrous upwards. *Leaves in middle third of stems* more or less evenly spaced and sized, oblanceolate to narrow-elliptic, 8–25 cm long, l:w ratio c. 3–6, not dissected but sometimes shallowly crenate; crenations few to several per side; base auriculate, semi-amplexicaul; margin crowded-denticulate; upper surface glabrous or sparsely

Figure 5. Distribution of a. *Senecio uiniuus*; b. *S. diasclides*; c. *S. biserratus*; d. *S. picridioides*; e. *S. bipiuuatisectus*; f. *S. distalilobatus*.

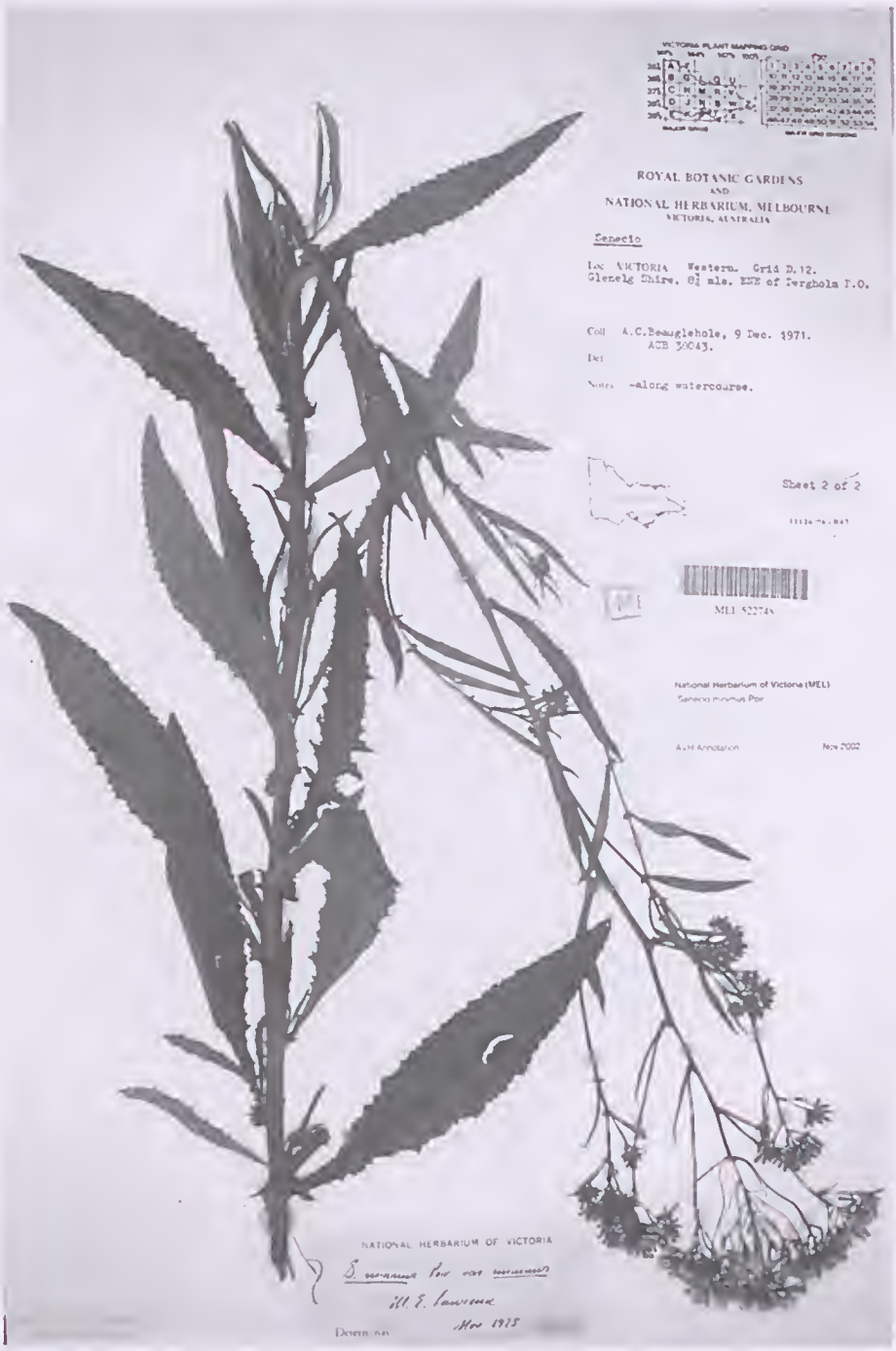

Figure 6. *Senecio minimus* (*A.C. Beauglehole 38043* MEL; note: the lobed leaf is considered aberrant).

scabridulous; lower surface usually green, sparsely eobwebby, (hairs on lower stem leaves eoarse basally). *Upperuost leaves* very narrow-elliptic, occasionally linear or narrow-laneeolate, l:w 3–10, sometimes widest at aurieles. *Unit inflorescences* of many capitula; total number of capitula per stem often several hundred; overtopping absent or slight; mature lateral peduncles mostly 5–10 mm long. *Capitula*: calycular bracteoles 3–5, 1.0–2.0 mm long; pedunele and margin of bracteoles ±glabrous to lightly eobwebby at anthesis; involucre 4.0–6.5 mm long, 1.0–1.5 mm diam.; phyllaries 7–10, glabrous; stereomes (in dried speeimens) ±flat, green, usually with a minute blaek tip; post-fructescence receptacle 1.5–2.0 mm diam., with phyllaries finally reflexed. *Florets* 12–25, e. 80% female; eorolla-lobes triangular, thiekened apically; eorolla of bisexual florets 4.5–6 mm long, 4- or 5-lobed; eorolla-lobes of female florets 3 or 4, 0.2–0.3 mm long. *Aeheues* narrow-obloid, 1.6–2.5 mm long, sometimes slightly angular, dull brown or dark red-brown, commonly somewhat lustrous, with papillose hairs in lines. *Pappus* 5–6 mm long. (Figs 2e, 3e, 6)

Flowers summer–autumn.

Distribution and Habitat: Occurs in far south-western Western Australia from Pemberton east to the Porongurup Range, in south-eastern Australia from Mt Glorious in far south-eastern Queensland south through eastern New South Wales to Mallacoota in far eastern Vietoria and from there west to Myponga in the Mount Lofty Range in south-eastern South Australia, and in Tasmania from Deal Island in Bass Strait south to Bruny Island (Fig. 5). Also native to New Zealand. Grows in rich soils in moister sites sueh as beside swamps and streams, in forest and woodland.

Notes: The inflorescences with numerous, small, slender capitula, and large leaves with more or less regular, crowded dentieulations and distinet reticulate venation make this speeies readily identifiable. The achenes eommonly have a few longitudinal ridges and it is common for the grooves of the aehene and hence the lines of hairs to be found at the summit of these ridges.

Senecio preuanthoides A.Rich. has been eited as the basionym for *Erechtites preuanthoides* DC. However, the former is a different speeies and is based on a collection by Gaudichaud, whereas the latter is based on a eollection by Labillardière.

Selected specimens examined: **WESTERN AUSTRALIA:** Halls Rock, Porongurup Range, 35 km north of Albany, *G.J. Keighery* 9350, 3.xii.1986 (PERTH). **SOUTH AUSTRALIA:** Lenswood, ca. 20 km east of Adelaide, *A.G. Spooner* 5180 (AD). **QUEENSLAND:** Mt Glorious Road, near The Summit, Mt Glorious, *S.P. Phillips 521 & B.A. Phillips,* 20.ix.2000 (BRI, MEL, NSW). **NEW SOUTH WALES:** Stephen's Creek (Cockwhy Ck), c. 5 km SW of Termeil, South Coast, *R. Pullen 8580 & J. Story,* 7.xi.1973 (CANB, NSW, PERTH); Junction of Coramba Mountain and Bushman's Range Roads, 12.6 km from turnoff at Coramba in the Orara West State Forest, *R.G. Coveny 16697 & A.J. Whalen,* 20.x.1993 (BRI, CANB, MEL, NSW). **VICTORIA:** Olinda Creek at Mt Evelyn Recreation Reserve, near York Road, c. 35 km east of Melbourne, A.B. Court for *R.V. Smith 59/8,* 21.i.1959 (AD, BRI, CANB, MEL). **TASMANIA:** Mt Field National Park, near Russell Falls, *W.M. Curtis,* 13.i.1943 (HO, MEL).

2. *Senecio diaschides* D.G.Drury, *New Zealand J. Bot.* 12: 522 (1974)

Type: Waipoua River, Waipoua forest [New Zealand], *K.A. Allison 95*, Feb. 1944; holo: CHR.

S. sp. B *sensu* M.E.Lawrenee, *Australian J. Bot.* 28: 155 (1980).

S. cahillii Belcher, *Muelleria* 5: 120 (1983), *nom. illeg. superfl.* Type: Vietoria, East Gippsland, Buchan River near junetion of Reedy River, *A.C. Beauglehole 41406*, 6 Feb. 1973; holo: MEL; iso: MEL.

Herbs to 1.5 m high. *Taproot* well-developed; seeondary roots hardly fleshy, 0.5–1 mm diam. *Stems* ereet, nearly glabrous or very sparsely eoarse-hairy basally; leafy axillary growth preeoeiously developed above mid stem. *Leaves in middle third of steus* more or

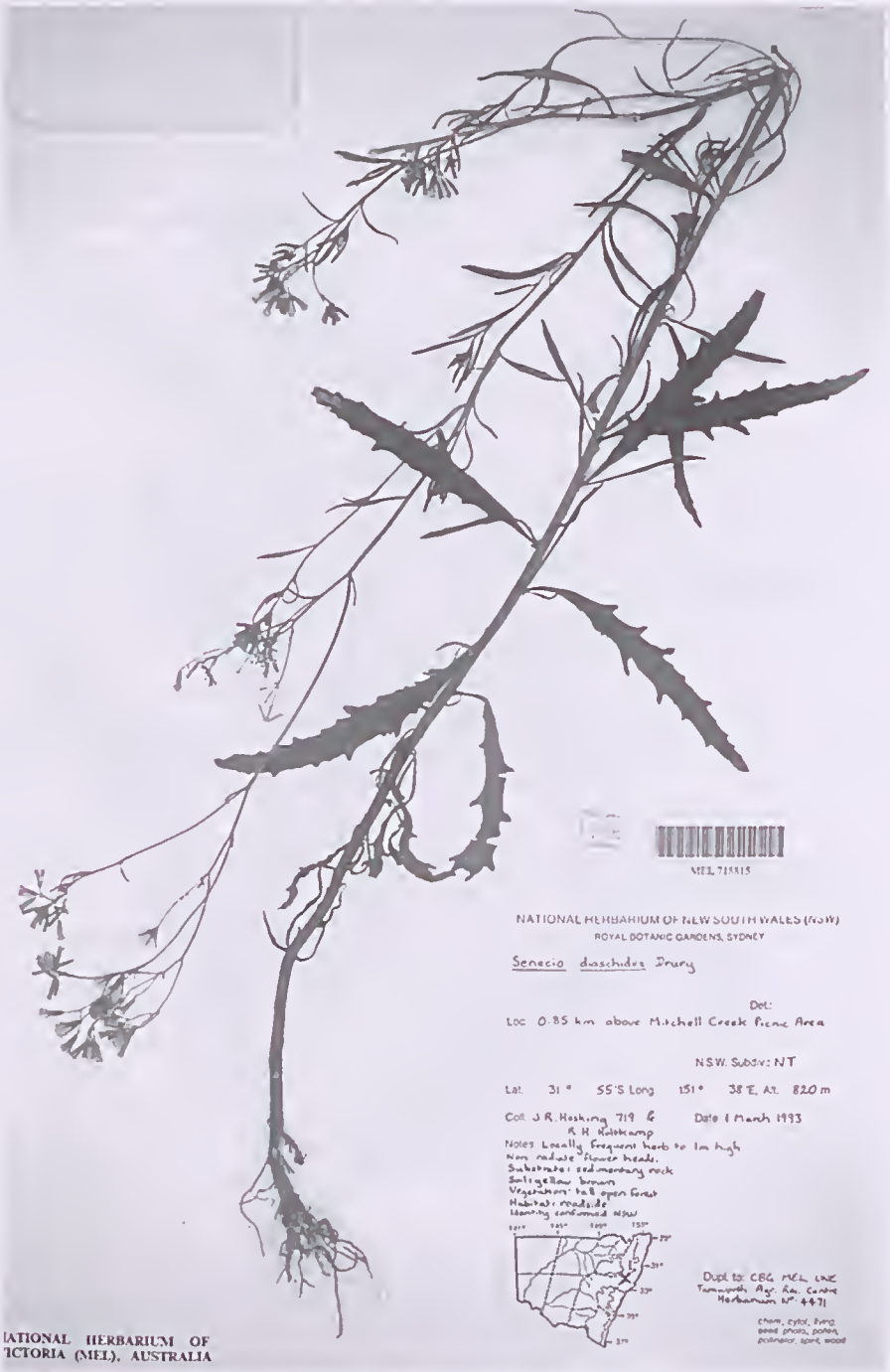
NATIONAL HERBARIUM OF NEW SOUTH WALES (NSW)
ROYAL BOTANIC GARDENS, SYDNEY
Senecio diaschides Drury
Det:
Loc 0·85 km above Mitchell Creek Picnic Area
N.S.W. Subdiv: NT
Lat. 31° 55'S Long. 151° 38'E, Alt. 820 m
Coll. J.R. Hosking 719 & R.H. Holtkamp
Date 1 March 1993
Notes Locally frequent herb to 1m high
non radiate flower heads.
Substrate: sedimentary rock
Soil: yellow brown
Vegetation: tall open forest
Habitat: roadside
Identity confirmed NSW
Dupl to: CBG, MEL, UNE
Tamworth Agr. Res. Centre
Herbarium No: 4471
IATIONAL HERBARIUM OF
ICTORIA (MEL), AUSTRALIA

Figure 7. *Senecio diaschides* (*J.R. Hosking 719 & R. Holtkamp* MEL).

less evenly spaced and sized, very narrow-elliptic to linear, 7–18 cm long, l:w ratio c. 5–10, coarse-dentate to deeply lobate, or rarely primary dissection lacking; segments 2–8 per side in the proximal three-quarters, antrorse, triangular to narrow-triangular; base becoming auriculate above mid stem; auricles pinnatisect, hardly amplexicaul; margin entire, with occasional minute denticulations; both surfaces glabrous or nearly so; lower surface green. *Uppermost leaves* linear to narrow-linear (excluding auricles) , sometimes widest at auricles; margin entire or appearing so due to rolling of lamina. *Unit inflorescences* of many capitula; total number of capitula per stem often 50–200; overtopping well-developed; mature lateral peduncles mostly 6–12 mm long. *Capitula*: calycular bracteoles 3–6, 1.0–2.0 mm long; pedunele and margin of bracteoles ±glabrous at anthesis; involucre 4.5–6.5 mm long, 1.0–1.5 mm diam.; phyllaries predominantly7–10, glabrous, with apex erect; stereomes (in dried specimens) flat or gently convex, green, commonly with a minute black tip, and sometimes also purple in a zone below tip; post-fructescence receptacle to c. 2.5 mm diam. with phyllaries commonly ±erect. *Florets* 12–25, c. 70% female; corolla-lobes ±triangular, thickened apically; corolla of bisexual florets 4.5–6.0 mm long, 4-lobed; corolla-lobes of female florets 3 or 4, 0.2–0.3 mm long. *Achenes* narrow oblong-ellipsoid, 2.2–2.5 mm long, brown, with papillose hairs in narrow bands, l:w ratio of hairs c. 3. *Pappus* 4–5 mm long. (Figs 2e, 7)

Flowers summer–autumn.

Distribution and Habitat: Occurs in south-western Western Australia from the Perth area SSE to Walpole, and in south-eastern Australia from Gympie in far south-eastern Queensland south through eastern New South Wales to Licola in eastern Victoria (Fig. 5). In Western Australia the lack of early records suggests that it may have been introduced to that state (Belcher 1983). Naturalised in New Zealand. Grows in alluvial soils adjacent to swamps and rivers, in forest and woodland.

Notes: The precociously developing leafy axillary growth is a feature of this species and of the otherwise dissimilar *S. quadridentatus*.

Selected specimens examined: **WESTERN AUSTRALIA:** Simmonds Block; Tuart Forest, *G.J. Keighery 14115*, 30.xi.1995 (PERTH). **QUEENSLAND:** Bald west of Long Plain, Bunya Mountains, *R.J. Fairfax 66*, 4.ii.1995 (BRI). **NEW SOUTH WALES:** 0.85 km above Mitchell Creek Picnic Area, *J.R. Hosking 719 & R.H. Holtkamp*, 1.iii.1993 (CBG, MEL, NSW, UNE); Long Swamp, King's Highway, c. 10 miles [16 km] east of Bungendore, *M. Gray 6080*, 18.xii.1967 (AD, BRI, CANB, HO, MEL, NSW). **VICTORIA:** West bank of Snowy River, c. 3 km upstream of the Snowy-Buchan River confluence, *N.G. Walsh 3015, D.E. Albrecht & J. Westaway*, 27.xi.1990 (MEL).

3. *Senecio biserratus* Belcher, *Ann. Missouri Bot. Gard.* 43: 43 (1956)

Senecio flaccidus A.Rich., in J.S.C. Dumont d'Urville, *Voy. Astrolabe* 2: 110 (1834), *nom. illeg. non* Less. (1831).

Type: [Tasmania], 'N. Holl. detr. d'Entreeasteaux', [D'Entreeasteaux Channel], Baudin voyage of 1826–29; holo: P.

Erechtites sonchoides DC., *Prodr.* 6: 296 (1838). *Type*: [?Tasmania], 'in Nova Hollandia meridionali' [southern Australia] Baudin voyage of 1826–29; G, *fide* R.O. Belcher, *loc. cit.*

Erechtites praealtoides sensu G. Bentham, *Fl. Austral.* 3: 658 (1867), *p.p.*; *sensu* J.M. Black, *Fl. S. Australia* 609-10 (1929).

Herbs to c. 1 m high. *Primary roots* well-developed, commonly branched; secondary roots hardly fleshy, 0.5–1 mm diam. *Stems* erect, sparsely or sometimes moderately coarse-hairy basally, density reducing upwards. *Leaves in middle third of stems* more or less evenly spaced and sized, elliptic to narrow-elliptic or lanceolate, 5–15 cm long, l:w ratio c. 1.5–4, coarse-dentate to deeply lobate; segments 3–9 per side extending along

Figure 8. *Senecio biserratus* (*T.B. Muir 2205* MEL).

much of length, tending to be larger in proximal two-thirds, antrorse, triangular to near oblong; base usually auriculate, with auricles divided, semiamplexicaul; margin serrulate or denticulate, with denticulations fairly frequent; both surfaces glabrous or sparsely scabridulous, rarely coarse-hairy; lower surface green or purple, ±glabrous except on veins. *Uppermost leaves* similar but l:w ratio 3–6, sometimes widest at auricles. *Unit inflorescences* of many capitula; total number of capitula per stem often 50–200; not overtopping or only moderate; mature lateral peduncles mostly 5–10 mm long. *Capitula*: calycular bracteoles 3–6, 1.0–2.0 mm long; peduncle and margin of bracteoles ±glabrous at anthesis; involucre 4.5–6.5(–7.5) mm long, 1.0–1.5 mm diam.; phyllaries predominantly 7–10, glabrous, with apex erect; stereomes (in dried specimens) flat to gently convex, thin, green, minutely purplish at tip; post-fructescence receptacle 1–2 mm diam., with phyllaries commonly finally reflexed. *Florets* 12–20, c. 70% female; corolla-lobes nearly oblong, thickened apically; corolla of bisexual florets 4.5–6 mm long, 4- or 5-lobed; corolla-lobes of female florets 3 or 4, 0.2–0.3 mm long. *Achenes* narrow oblong-ellipsoid, (2.0–)2.5–3.2 mm long, dark brown, with papillose hairs in dense bands, l:w ratio of hairs c. 3. *Pappus* 5–6 mm long. (Figs 2j, 4e, 8)

Flowers spring–autumn.

Distribution and Habitat: Occurs in far south-eastern Australia, largely on the coast, from Younghusband Peninsula in far south-eastern South Australia east through southern Victoria to far south-eastern New South Wales; also in northern Tasmania including islands in Bass Strait (Fig. 5). Also native to New Zealand. Grows in sandy, loamy and peaty soils in coastal woodland, shrubland, and grassland, and less often in forests at low to moderate altitudes.

Notes: This species is similar to *S. distalilobatus* but differs by being usually less coarse-hairy, having leaves with more triangular segments and denticulations that are slightly serrate and very acute to acuminate rather than subacute or obtuse, achenes that are longer, more slender and with more robust papillose hairs, and by having different root morphology. *Senecio biserratus* is predominantly a coastal plant but it has been recorded from Mt Buninyong and Mt Macedon in south-central Victoria. *Senecio distalilobatus* occurs at altitudes over 800 m. *Senecio biserratus* also resembles *S. minimus* and *S. picridioides* but differs most obviously by the degree of dissection and the shape of segments of leaves.

Selected specimens examined: **SOUTH AUSTRALIA:** SE, 5.5 km SSE of Gleneoe, in Honan's Scrub Native Forest, *P.J. Lang 2461*, 21.xi.1995 (AD, HO). **NEW SOUTH WALES:** Billangabee Creek, Ben Boyd National Park, 19 km SE of Eden, *R. Coveny 5802 & J. Armstrong*, 16.x.1974 (MEL, NSW). **VICTORIA:** Wilsons Promontory National Park. Five and Three Mile Beaches (east coast), *P.C. Heyligers 80192*, Nov. 1980 (CANB, MEL). **TASMANIA:** Elliott Point, *A. Moscal 11877*, 20.i.1986 (HO).

4. *Senecio picridioides* (Turcz.) M.E.Lawr., *J. Adelaide Bot. Gard.* 7: 292 (1985)

Erechtites picridioides Turcz., *Bull. Soc. Imp. Naturalistes Moscou* 24(1): 200 (1851); J.M. Black, *Fl. S. Australia* 610 (1929); *E. prenanthoides* DC. var. *picridioides* (Turcz.) Benth., *Fl. Austral.* 3: 658 (1867); *S. minimus* Poir. var. *picridioides* (Turcz.) Belcher, *Ann. Missouri Bot. Gard.* 43: 48 (1956).

Type: [Western Australia], 'Nova Hollandia', *J.Drummond III 132*; syn: K, FI, *fide* R.O. Belcher *loc. cit.*

Herbs to 1 m high. *Taproot* usually moderately well-developed; secondary roots fleshy, 0.7–1.5 mm diam. *Stems* erect, sparsely to moderately coarse-hairy, density reducing upwards. *Leaves in middle third of stems* sometimes becoming distinctly wider spaced and narrower upwards, elliptic to narrow-elliptic, narrow-oblong or narrow-ovate to lanceolate,

MEL 2021245
NATIONAL HERBARIUM OF VICTORIA (MEL)
MELBOURNE, AUSTRALIA
MEL 2021245
319 ASTERACEAE
Senecio picridioides (Turcz.) M.E.Lane
Coll: I.C. Clarke 2299 Date: 20 Oct 1993
AUSTRALIA VICTORIA
Locality: Lowan Mallee, Little Desert National Park, central block, Broughtons Waterhole, 21 km SSE of Kanawa.
Lat: 36°34'S Long: 141°20'E
Vic. Grid Ref.: C.M.
Notes: Growing on Eucalyptus leucoxylon open woodland with scattered shrubby and grassy understorey. Sandy soil. Erect herb to 60 cm tall. Florets yellow. Leaves purple below.
Occasional.
Duplic: AD, CANB
NATIONAL HERBARIUM OF VICTORIA (MEL), AUSTRALIA

Figure 9. *Senecio picridioides* (*I.C. Clarke 2299* MEL).

6–20 cm long, l:w ratio c. 2–4, lobate to deeply lobate; segments 4–6 per side extending along most of length, spreading, or more distal ones slightly antrorse, commonly roughly semicircular; base auriculate, somewhat amplexicaul; margin crowded-denticulate; both surfaces with coarse hairs; lower surface (and upper midrib) commonly strongly purple. *Uppermost leaves* narrow-oblong or lanceolate, l:w ratio c. 3–5, usually widest at auricles. *Unit inflorescences* of many capitula; total number of capitula per stem often 50–100; overtopping usually moderate; mature lateral peduncles mostly 6–12 mm long. *Capitula*: calycular bracteoles 2–6, 1.0–2.0 mm long; peduncle and margin of bracteoles ±glabrous at anthesis; involucre 6–8 mm long, c. 1.2–1.8 mm diam.; phyllaries 7–10, glabrous, with apex erect; stereomes (in dried specimens) flat to gently convex, green, commonly minutely purple at tip; post-fructescence receptacle c. 3 mm diam., with phyllaries commonly finally erect. *Florets* 15–30, c. 70% female; corolla-lobes triangular, not or slightly thickened apically; corolla of bisexual florets 5.5–6.6 mm long, 5-lobed; corolla-lobes of female florets 4, c. 0.2 mm long; corolla-limb commonly also with a deeper cleft on inner face. *Achenes* narrow obloid, 2.0–2.2 mm long, brown, with papillose hairs in bands, l:w ratio of hairs c. 3–4. *Pappus* 5.5–6 mm long. (Fig. 9)

Flowers spring–summer.

Distribution and Habitat: Occurs in southern Western Australia from the Stirling Ranges east to Mt Buraminya, and in south-eastern Australia from the Marble Range in south-central South Australia east to Werribee in south-central Victoria (Fig. 5). Grows in sand, red-brown loam derived from ironstone, or clay-loam, often in depressions and shaded and rocky sites, in dune scrub, woodland and sometimes dry forest.

Notes: The typically strong purple coloration of stems and lower surface of leaves, the nature of the primary dissection and the strongly amplexicaul leaves make this species readily identifiable. The name *E. picridioides* Turcz. should not be confused with the illegitimate name *E. picridioides* Sond. which is *S. runcinifolius* Willis.

Selected specimens examined: **WESTERN AUSTRALIA:** c. 1.6 km NE of Bungalbin Hill, Helena and Aurora Range, *B.J. Lepschi 2068*, 27.ix.1995 (CANB, MEL, NSW, PERTH). **SOUTH AUSTRALIA:** Kangaroo Island, eastern end. Dudley Peninsula, *G. Jackson 863*, 14.xi.1971 (AD); Hundred of Moorooroo. Upper tributary of Tanunda Creek near Schlenke Gully, *P.J. Lang 1700*, 25.vii.1985 (AD, BRI). **VICTORIA:** Little Desert National Park, central block. Broughton's Waterhole, 23 km SSE of Kaniva, *I.C. Clarke 2299*, 20.x.1993 (AD, CANB, MEL).

5. *Senecio bipinnatisectus* Belcher, *Ann. Missouri Bot. Gard.* 43: 41 (1956)

Erechtites atkinsoniae F.Muell., *Fragm.* 5: 88 (1865); G. Bentham, *Fl. Austral.* 3: 658 (1867); *S. atkinsoniae* F.Muell., *Fragm.* 5: 88 (1865), *nom. inval.* [placed in synonymy under *E. atkinsoniae*]

Type: [New South Wales], Blue Mountains, *L. Atkinson*; lecto: K, *fide* R.O. Belcher, *loc. cit.*; isolecto: MEL. [Remaining syntype: Monkey Creek near Port Jackson, *W. Woolls*; MEL]

Herbs to 1.5 m high. *Primary roots* well-developed; secondary roots not fleshy, 0.5–1 mm diam. *Stems* erect, nearly glabrous. *Leaves in middle third of stems* more or less evenly spaced and sized, broad-elliptic, 10–15 cm long, l:w ratio c. 1.5–2, pinnatisect to bipinnatisect; segments 4–6 per side extending along most of length, antrorse, shape various depending on secondary dissection; base auriculate, with auricles pinnatisect, slightly amplexicaul; margin with occasional denticulations or teeth; upper surface ±glabrous; lower surface green, sparsely coarse-hairy or ±glabrous. *Uppermost leaves* pinnatisect, l:w ratio c. 2–3, not widest at auricles. *Unit inflorescences* of many capitula; total number of capitula per stem often 50–200; overtopping usually moderate; mature lateral peduncles mostly 6–12 mm long. *Capitula*: calycular bracteoles 3–6, 1.5–2.5 mm long; peduncle and margin of bracteoles glabrous or nearly so at anthesis; involucre

Figure 10. *Senecio bipinnatisectus* (*C. Stuart 770* MEL).

5.0–7.0 mm long, c. 1.2–1.8 mm diam.; phyllaries 8–10(–13), glabrous, with apex erect; stereomes (in dried specimens) flat to gently convex, green, minutely purple or black at tip; post-fructescence receptacle to c. 2.5 mm diam., with phyllaries commonly finally reflexed. *Florets* 15–25, c. 70% female; corolla-lobes triangular, slightly thickened apically; corolla of bisexual florets 5–5.5 mm long, 4- or 5-lobed; corolla-lobes of female florets 3 or 4, c. 0.2 mm long. *Achenes* narrow obloid, 1.8–2.2 mm long, dark red-brown, minutely granular; with papillose hairs somewhat sparse in lines, l:w ratio of hairs c. 3. *Pappus* 4–5 mm long. (Fig. 10)

Flowers most times of year.

Distribution and Habitat: Occurs in eastern Australia, in far north Queensland and disjunctly from Candle Mountain in south-eastern Queensland south to Mt Dromedary in far south-eastern New South Wales (Fig. 5). Naturalised in New Zealand. Grows in forests, woodlands, and shrublands

Notes: Similar in leaf form to *S. bathurstianus* and *S. brevitubulus* but differing from these two species in indumentum and capitular characters. Involucres are longer, more slender, and with fewer, less convex phyllaries, and florets are fewer.

Selected specimens examined: **QUEENSLAND:** Near Sunday Creek forestry camp, 20 miles [32 km] WNW of Maleney, *coll. unknown* (BRI); Mt Mitchell, Cunningham's Gap, *P.I. Forster PIF11107 & R. Reilly*, 18.viii.1992 (BRI, MEL). **NEW SOUTH WALES:** 15.4 km west of Gingers Creek, Oxley Highway, *R.H. Holtkamp 15 & A. Maguire*, 9.ii.1993 (CBG, MEL, NSW, UNE); Base of Mt Killickrankie, Oakes State Forest, WSW of Bellingen, *A.R. Bean 14599*, 30.i.1999 (BRI).

6. *Senecio distalilobatus* I.Thomps., *sp. nov.*

A *S. hispidulo* A.Rich. radice principali redacta, indumento caulium plerumque densiore, lobis foliorum distalioribus, pedunculis brevioribus, phyllariis plerumque paucioribus differt; a *S. biserrato* Belcher radice principali redacta, indumento caulium plerumque densiore, dentibus foliorum non antrorsibus, acheniis brevioribus papillis debilibus differt.

Type: Victoria, Razorback Forest Block, 1.4 km north of Mt Cooper, Razorback Spur Track, 500m south of Limestone Creek Track, alt. 1180 m, *G.W. Carr 10361*, 1 Feb. 1985; holo: MEL.

Herbs to 1.5 m high. *Taproot* inconspicuous; secondary roots fleshy, 0.5–1.2 mm diam. *Stems* erect; moderately coarse-hairy, density reducing upwards, rarely nearly glabrous throughout. *Leaves in middle third of stems* more or less evenly spaced and sized, narrow-oblong to narrow-elliptic, 6–12 cm long, l:w ratio c. 2–4, lobate to subpinnatisect; segments 3–6 per side extending along most of length, slightly antrorse, triangular, oblong or obovate; base attenuate or leaves above mid stem usually auriculate, with auricles divided, slightly amplexicaul; margin with scattered denticulations or teeth; both surfaces coarse-hairy, occasionally nearly glabrous; lower surface green, sometimes with a cobwebby overlay over coarse hairs. *Uppermost leaves* narrow-elliptic, l:w 3–6, not usually widest at auricles. *Unit inflorescences* of many capitula; total number of capitula per stem often 50–100; overtopping variable; mature lateral peduncles mostly 5–10 mm long. *Capitula*: calycular bracteoles 3–6, 1.0–2.0 mm long; peduncle and margin of bracteoles sparsely hairy or ±glabrous at anthesis; involucre 5.0–7.0 mm long, 1.0–1.5 mm diam.; phyllaries 7–10(–12), glabrous, with apex erect; stereomes (in dried specimens) flat to gently convex, green, sometimes purplish, commonly minutely black at tip; post-fructescence receptacle to c. 2 mm diam., with phyllaries commonly finally reflexed. *Florets* 12–20, c. 70% female; corolla-lobes ±triangular, thickened apically; corolla of bisexual florets 5–6 mm long, 5-lobed; corolla-lobes of female florets 4 or 5,

HOLOTYPE
FLORA OF AUSTRALIA PROJECT
Senecio distalilobatus I.Thomps.
Det Ian Thompson Date 18.v.2003
MEL677042
NATIONAL HERBARIUM OF VICTORIA (MEL)
MELBOURNE AUSTRALIA
Senecio diserratus Belcher
Family: COMPOSITAE
Loc: VICTORIA. Alpine Study Area, Razorback Forest Block. 1.4km N of Mt Cooper. Razorback Spur Tk, 500m S of Limestone Creek Tk.
Alt: 1180m
Lat. 36°05'50" Long. 147°32'20" Grid V&O
Coll: G.W.Carr 10361 1 Feb 1985
Det G.W.Carr.
Notes: Locally common on disturbed roadside following clear felling of forest; loam soil derived from metamorphosed sediments; erect herb.
Dupl
NATIONAL HERBARIUM OF VICTORIA (MEL), AUSTRALIA

Figure 11. *Senecio distalilobatus* (holotype: *G.W. Carr 10361* MEL).

c. 0.2 mm long. *Achenes* narrow obloid to narrow-ellipsoid, 2.0–2.8 mm long, medium to dark red-brown, with relatively fine papillose hairs in lines or somewhat scattered; l:w ratio of hairs c. 3. *Pappus* 5–6 mm long. (Figs 2g, 4d, 11)

Flowers summer–early autumn.

Distribution and Habitat: Occurs in south-eastern Australia from Glen Elgin in north-eastern New South Wales south to eastern Victoria and as far east as Mt Howitt. Possibly also in the Bunya Mountains in south-eastern Queensland (Fig. 5). Grows in loam soils in forests usually at altitudes over 800 m.

Etymology: The epithet alludes to the relatively distal occurrence of primary and marginal dissection (L: *distalis*, distal, and *lobatus*, lobed).

Notes: *Senecio distalilobatus* was previously regarded as a form of *S. biserratus*. Differences are outlined under the latter. *Senecio distalilobatus* also resembles *S. hispidulus* but its leaves have a more distal development of segments and teeth, upper stem leaves are narrow-elliptic rather than lanceolate to linear, auricles are relatively smaller, involucres contain usually fewer, less convex and finally reflexed phyllaries, corolla-lobes of female florets are shorter, and achenial hairs are finer. In the Bunya mountains specimens have been collected that are difficult to distinguish from *S. hispidulus*.

Selected specimens examined: **QUEENSLAND:** Bunya Mt., Bell road about 3 miles [5 km] south of Mt Mowbullan Guest House, *R.W. Johnson 455 & L. Pedley*, 3.v.1958 (BRI). **NEW SOUTH WALES:** Point Lookout, *T. Bisalputra*, 25.ii.1958 (NE); Compartment 31, Stewarts Brook State Forest, Barrington Tops, *J.R. Hosking 683*, 11.ii.1993 (CBG, MEL, NE); Bendora to Mt Franklin A.C.T. near Parrot Rd. turnoff, *M. Gray 5022*, 7.ii.1961 (CANB, MEL); Port Philip Trail, Kosciuszko N.P., *I.R. Thompson 751 & N.G. Walsh.*, 31.i.2002 (MEL). **VICTORIA:** East Gippsland. Mt Tennyson, *J.V. Yugovic 262 & A.M. Opie*, 12.iii.1986 (MEL); Tingaringy National Park. Mt Tingaringy, *A.C. Beauglehole 67850*, 29.i.1980 (MEL); North-east – 46 km SSE from Whitfield via Upper Rose River Road to creek crossing on McCartney's Basin track in Wabonga Plateau State Park, *A. Piesse 809*, 18.ii.1987 (MEL).

7. *Senecio brevitubulus* I.Thomps., *sp. nov.*

A *S. bathurstianus* (DC.) Sch.Bip. foliis glabris, aeheniis longioribus, papillis non dispersis differt; a *S. bipinnatisectus* caulibus pilis grossis instructus, phyllariis et flosculis multioribus, corollis brevioribus differt.

Type: Queensland, about 1/2 mile north of Woodford-Kilcoy-Beerwah road junction on both sides of road for about 1/2 mile, 26°57' S, 152°46' E, *H.S. Tutt*, Nov. 1969; holo: BRI.

Herbs to c. 1 m high. *Roots* not seen. *Stems* coarse-hairy, sparsely so on upper stem. *Leaves in middle third of stems* more or less evenly spaced and sized, broad-elliptic to narrow-elliptic, 8–12 cm long, l:w ratio c. 1.5–3, pinnatisect; segments 3–6 per side extending along most of length, antrorse, ±linear or variously shaped if secondary dissection present; base auriculate, with auricles pinnatisect, moderately stem clasping; margin with scattered denticulations or teeth; both surfaces glabrous or a few coarse hairs on midrib of lower surface; lower surface green. *Uppermost leaves* pinnatisect, l:w ratio c. 2–4, not widest at auricles. *Unit inflorescences* of many capitula; total number of capitula per stem often 50–100; overtopping moderate; mature lateral peduncles mostly 4–10 mm long. *Capitula*: calycular bracteoles 3–6, 1.0–2.0 mm long; peduncle and margin of bracteoles ±glabrous at anthesis; involucre 3.5–4.5 mm long, c. 1.4–1.8 mm diam.; phyllaries 11–13, glabrous, with apex erect; stereomes (in dried specimens) moderately convex, green, commonly black at tip; post-fructescence receptacle to 2.5 mm diam., with orientation of phyllaries unknown. *Florets* 30–45, c. 80% female; corolla-

Figure 12. Distribution of a. *Senecio brevitubulus*; b. *S. bathurstianus*; c. *S. hispidulus*; d. *S. hispidissimus*; e. *S. multicaulis* subsp. *multicaulis*; f. *S. multicaulis* subsp. *stirlingensis*.

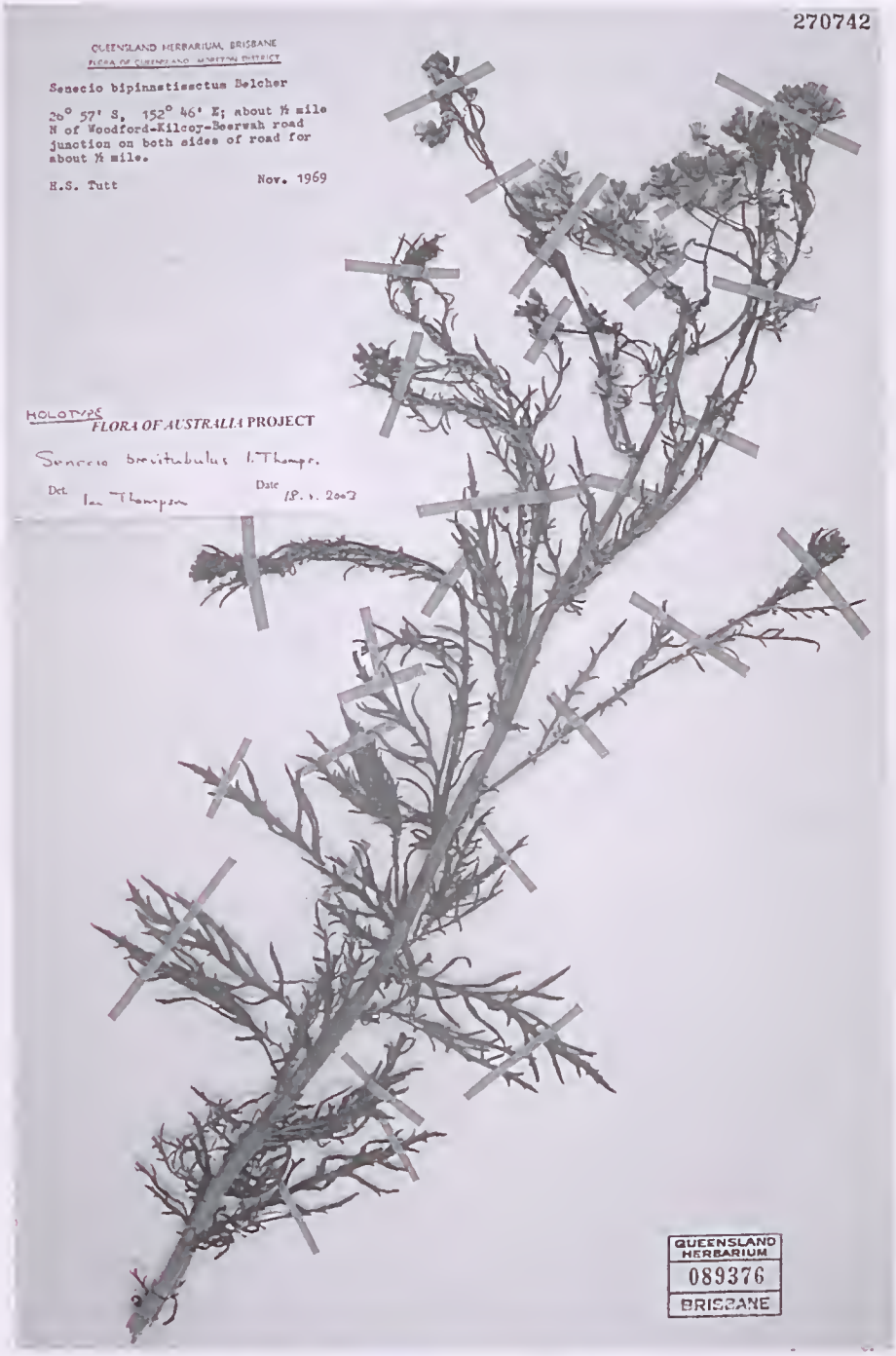

Figure 13. *Senecio brevitubulus* (holotype: *H.S. Tutt s.n.* BRI).

lobes triangular, thickened apically; corolla of bisexual florets 4–5 mm long, 4-lobed; corolla-lobes of female florets 3 or 4, 0.1–0.2 mm long. *Achenes* narrow oblong-ellipsoid, 2.0–2.7 mm long, red-brown, with papillose hairs in lines, l:w ratio of hairs c. 3. *Pappus* 4–5 mm long. (Fig. 13)

Flowers late spring– early autumn.

Distribution and Habitat: Occurs in south-eastern Queensland from Cooroy west to the Bunya Mtns, and in far north-eastern New South Wales on Acacia Plateau near the Queensland-New South Wales border (Fig. 12a). Grows in rainforest clearings.

Etymology: The epithet alludes to the relatively short, tubular corollas. The corolla of female florets is less than twice as long as the mature achene. (L: *brevis*, short, and *tubulus*, tubule).

Notes: Similar in leaf form to *S. bipinnatisectus*, but perhaps more closely related to *S. bathurstianus* because of its coarse-hairy stems and short, relatively plump capitula with an involucre of c. 13 phyllaries. Achenes of *S. brevitubulus* are longer than those of the aforementioned species, but the corolla is shorter.

Selected specimens examined: **QUEENSLAND:** West Cooroy; on roadside, *N.J. Douglas*, Dec. 1959 (BRI); Saddletree Creek, Bunya Mtns National Park, *R.J. Fensham RJF3501*, 18.xi.1998 (BRI). **NEW SOUTH WALES:** Acacia Plateau, near Q[ueensland] border, *C.T. White 12734*, 16.iii.1944 (BRI).

8. *Senecio bathurstianus* (DC.) Sch.Bip., *Flora* 28: 498 (1845)

Erechtites bathurstiana DC., *Prodr.* 6: 297 (1838); *E. arguta* (A.Rich.) DC. var. *dissecta* Benth., *Fl. Austral.* 3: 659 (1867); *E. arguta* (A.Rich.) DC. var. *bathurstiana* (DC.) Domin, *Biblioth. Bot.* 89: 685 (1930); *S. hispidulus* A.Rich. var. *dissectus* (Benth.) Belcher, *Ann. Missouri Bot. Gard.* 43: 69 (1956).

Type: [New South Wales], around Bathurst, *A. Cunningham 135*; holo: G (microfiche seen MEL).

Herbs to 1.5 m high. *Taproot* well-developed; secondary roots fine, c. 0.5 mm diam. *Stems* erect, ±densely coarse-hairy density reducing upwards, sparse in upper third, rarely ±glabrous. *Leaves in middle third of stems* more or less evenly spaced and sized, broad-elliptic to elliptic in outline, 7–15 cm long, l:w ratio c. 1.5–3, pinnatisect to sub-bipinnatisect; segments 4–6 per side extending along most of length, antrorse, shape various depending on secondary dissection; base auriculate, with auricles pinnatisect; margin with scattered denticulations or teeth; both surfaces coarse-hairy; lower surface green or tinged purple, with coarse hairs, sometimes with cobwebby overlay. *Uppermost leaves* pinnatisect or at summit sometimes linear, l:w ratio c. 3–5, usually not widest at auricles. *Unit inflorescences* of many capitula; total number of capitula per stem often 50–200; overtopping moderate; mature lateral peduncles mostly 7–20 mm long. *Capitula*: calycular bracteoles 3–6, 1.0–2.0 mm long; peduncle and margin of bracteoles sparsely hairy or ±glabrous at anthesis; involucre 3.5–6.0(–7.0) mm long, 1.5–2.0 mm diam.; phyllaries (9–)11–13, glabrous, with apex erect; stercomes (in dried specimens) moderately convex, green, sometimes minutely brown or black at tip; post-fructescence receptacle 3–4 mm diam., with phyllaries commonly finally erect. *Florets* 20–35, c. 80% female; corolla-lobes oblong, thickened apically; corolla of bisexual florets 4–5.5 mm long, 5-lobed; corolla-limb of female florets 4 or 5, 0.2–0.3 mm long. *Achenes* ±narrow obloid, 1.5–2.0 mm long, red-brown or blackish, with papillose hairs, somewhat scattered or sometimes in bands, l:w ratio of hairs c. 3–4. *Pappus* 4–5 mm long. (Figs 2h, 14)

Flowers spring–summer.

National Herbarium of Victoria (MEL)
Senecio bathurstianus (DC.) Sch.Bip.
Seen for Flora of Australia
Determined I.R. Thompson Oct 2002
MEL 293979
EX QUEENSLAND HERBARIUM (BRI)
Flora of Queensland Leichhardt
Senecio hispidulus var. dissectus (Benth.) Belcher
Coll. P.I.Forster PIF19745 25 SEP 1996
25°19'S 150°01'E Alt. 280 m
Depth m
Precipice National Park, catchment of Precipice Creek
(GPS 25 19 31 150 01 37)
Woodland of Angophora leiocarpa, Eucalyptus crebra and
E. acmenoides on sandstone cliffines along seasonal
watercourse
Herb, yellow flowers
Occasional in area
Det. Compositae
Dups MEL
*May be cited as computerised collection number AQ 603596
(Archival Paper)
NATIONAL HERBARIUM OF
VICTORIA (MEL), AUSTRALIA

Figure 14. *Senecio bathurstianus* (*P.I. Forster 19745* MEL).

Distribution and Habitat: Occurs in eastern Australia from Kroombit Tops National Park near Biloela in south-eastern Queensland south through eastern New South Wales to the Upper Genoa River in far eastern Victoria and from there west to Mt Bepeha in western Victoria (Fig. 12b). Often grows in poorer soils and often associated with rocky outcrops, eg. of sandstone or granite, in drier forest and woodland.

Notes: Similar in leaf form to *S. bipinnatisectus* and *S. brevitubulus*. Also similar to *S. hispidulus* which has less divided leaves, but with stems and leaves more densely coarse-hairy, capitula usually with more florets, and achenes with papillose hairs more scattered. *Senecio glomeratus* has similar-sized capitula and leaf dissection sometimes approaching that of *S. bathurstianus*, but the latter has calycular bracteoles shorter and fewer, and not cobwebby at anthesis. A specimen from Molonglo Gorge in the Australian Capital Territory (*H.S. McKee 11781*, BRI) is typical of *S. bathurstianus* except that it is glabrous. A specimen from Tarana, New South Wales (*H.S.McKee 7047*, CANB) is atypical in having involucres of only 8 or 9 phyllaries.

Selected specimens examined: **QUEENSLAND:** Palmgrove National Park, NW of Taroom, Bigge Range, *P.I. Forster PIF23765 & R. Booth*, 4.xi.1998 (BRI, MEL). **NEW SOUTH WALES:** Weddin Mountain, c. 18 km west of Grenfell, *R. Pullen 10236*, 6.xii.1975 (AD, CANB, MEL, NSW). **VICTORIA:** Reef Hills Regional Park SW of Benalla, *A.C. Beauglehole 66149*, 2.xi.1979 (CANB, HO, MEL, NSW, PERTH); 9.3 km SSW of Mt Tambo, Spring Hill Tk, near summit of Spring Hill, *G.W. Carr 10279*, 11.xii.1984 (AD, CANB, MEL).

9. *Senecio hispidulus* A.Rich., in J.S.C. Dumont d'Urville, *Voy. Astrolabe* 2: 92, t. 34 (1834)

Erechtites hispidula (A.Rich.) DC., *Prodr.* 6: 296 (1838).

Type: [Tasmania], 'Crescit in Insula Van Diemen', 1828, *A. Lesson 18*; holo: P.

Erechtites arguta sensu J.D. Hooker, *Fl. Tasmania* 1: 220 (1860), *p.p.*; *sensu* G. Bentham, *Fl. Austral.* 3: 660 (1867), *p.p.*; *sensu* L. Rodway, *Tasman. Fl.* 94 (1903), *p.p.*, *sensu* J.M. Black, *Fl. S. Australia* 610 (1929), *p.p.*; *sensu* A. Ewart, *Fl. Victoria* 1180 (1931) *p.p.*

Herbs to 1.5 m high. *Taproot* well developed; secondary roots hardly fleshy, 0.5–1 mm diam. *Stems* erect, sparsely to moderately coarse-hairy reducing to ±glabrous above mid stem. *Leaves in middle third of stems* more or less evenly spaced and sized, narrow-ovate to lanceolate, less often narrow-elliptic or linear, 7–15 cm long, l:w ratio c. 2.5–6, usually coarse-dentate to sub-pinnatisect; segments 2–5 per side predominantly in proximal two-thirds, larger divisions usually in proximal half, slightly antrorse, triangular–narrow-triangular, or occasionally sub-oblong; base auriculate, with auricles divided, semiamplexicaul; margin with scattered denticulations or teeth; both surfaces coarse-hairy; lower surface green or tinged purple, sometimes with a weak cobwebby overlay over coarse hairs. *Uppermost leaves* narrow-lanceolate or linear, l:w ratio c. 5–15 (excluding auricles), lobate or appearing undissected due to rolling of lamina, often widest at auricles. *Unit inflorescences* usually of many capitula; total number of capitula per stem often 50–100; overtopping marked; mature lateral peduncles mostly 7–14 mm long. *Capitula*: calycular bracteoles 3–6, 1.0–2.5 mm long; peduncle and margin of bracteoles ±glabrous at anthesis; involucre 4.5–6.0 mm long, 1.4–1.8 mm diam.; phyllaries (9–)11–13, glabrous, with apex erect; stereomes (in dried specimens) moderately convex, green, minutely black at tip; post-fructescence receptacle 3–3.5 mm diam., with phyllaries commonly finally erect. *Florets* 18–35, c. 70% female; corolla-lobes triangular, thickened apically; corolla of bisexual florets 4.5–6 mm long, 5-lobed; corolla-lobes of female florets 4, 0.3–0.5 mm long. *Achenes* narrow-obloid, 1.5–2.2 mm long, red-brown, glabrous or with papillose hairs in lines or narrow bands, l:w ratio of hairs c. 3. *Pappus* 4–6 mm long. (Figs 1a, 2d, 3i, 15)

Flowers spring–summer.

Figure 15. *Senecio hispidulus* (*A.C. Beauglehole 66523* MEL).

Distribution and Habitat: Occurs in far south-western Western Australia from Nannup south-east to Denmark with an outlier on Thomas Island, and in south-eastern Australia from the Bunya Mountains in south-eastern Queensland south through eastern New South Wales to Victoria, and from Mallacoota in far eastern Victoria west to Kangaroo Island in south-eastern South Australia (Fig. 12c). Also native to New Zealand. Grows in forest and woodland.

Notes: Involueres of this species mostly comprise 11–14 phyllaries, but occasional plants have involueres of predominantly 9 or 10. Compared to *S. bathurstianus* the leaves of *S. hispidulus* are less deeply dissected, capitula are mostly more slender and with fewer florets, stems and leaves are less densely coarse-hairy and achenes are glabrous or with hairs arranged more in lines. Glabrous achenes are predominantly found in specimens from New South Wales.

The name *S. hispidulus* was misapplied by Bentham to species with larger capitula, specifically *S. squarrosus* and *S. macrocarpus*, and this misapplication persisted in Australian floras until 1956 when Belcher clarified its application.

Selected specimens examined: **WESTERN AUSTRALIA:** Bibbulmun Track, Donnelly River Valley, 200 m south of Campers hut, *V.L. Tunstall, R. Cranfield & R. Hearn 163*, 8.xii.1999 (PERTH). **SOUTH AUSTRALIA:** Southern Lofty. At Jupiter Creek below dam, *R.J. Bates 26777*, 23.xii.1991 (AD, MEL, NSW). **QUEENSLAND:** Mt Roberts, McPherson range, *S.T. Blake 21561*, 20.viii.1961 (BRI). **NEW SOUTH WALES:** Southern Tablelands, Corner Hill, SE slope, c. 11 km NW Captains Flat, *N.M. Taws 806*, 23.xii.1995 (CANB). **VICTORIA:** The Pyrenees Number Two Creek 10 km west of Avoca, *A.C. Beauglehole 66523*, 20.xi.1979 (CANB, MEL); 1.3 km SE Lang Lang on road to Nyora, *M.E. Lawrence 1084*, 3.xii.1978 (MEL). **TASMANIA:** Outskirts of Hobart: Forest Road extension, Knocklofty, *A.E. Orchard 5016*, 16.iv.1978 (HO).

10. *Senecio hispidissimus* I.Thomps., *sp. nov.*

A *S. hispidulo* A.Rich. radice principali minore, incisio foliorum proximalis minus, indumento foliorum et caulis densiore, capitulis majoribus, phyllariis purpureis apicem versus differt.

Type: Victoria, Little Desert National Park, central block, c. 1 km SE of Broughtons Waterhole, north of Sambells Track, *I.C. Clarke 2380*, 21 Oct. 1993; holo: MEL.

Erechtites arguta DC. var. *asper* Hook.f., *London. J. Bot.* 6: 122 (1847). Type: Tasmania, Woolnorth, *R.C. Gunn*; syn: K (photo seen MEL).

S. sp. C forms 3 and 4 *sensu* M.E. Lawrence, *Australian J. Bot.* 28: 155 (1980).

Herbs to 1 m high. *Taproot* inconspicuous; secondary roots fleshy, c. 1–1.5 mm diam. *Stems* erect, typically densely coarse-hairy, density gradually reducing upwards. *Leaves in middle third of stems* sometimes becoming distinctly wider spaced and narrower upwards, narrow-elliptic or linear, 6–13 cm long, l:w ratio c. 4–7, coarse-dentate to lobate, occasionally not dissected; segments 3–7 per side, predominantly in distal two-thirds, slightly antrorse, triangular to sub-oblong; base auriculate, with auricles dissected or not, semiamplexicaul; margin with occasional denticulations or teeth; both surfaces moderately to densely coarse-hairy; lower surface green. *Uppermost leaves* very narrow-oblong to narrow-lanceolate, l:w ratio c. 7–10, commonly widest at auricles. *Unit inflorescences* of several to many capitula; total number of capitula per stem often 10–100; overtopping marked; mature lateral peduncles mostly 8–25 mm long. *Capitula*: calycular bracteoles 5–8, 1.5–3.0 mm long; peduncles ±glabrous at anthesis, margin of bracteoles often sparsely coarse-hairy; involucre (5.0–)6.0–9.0 mm long, 1.8–2.5 mm diam.; phyllaries mostly 11–14, glabrous, with apex erect; stereomes (in dried specimens) flat to gently convex, green with a purple apical zone c. 0.5–2 mm long or sometimes entirely purple; post-fruiteseence receptacle 3–4 mm diam., with phyllaries commonly finally erect. *Florets* 20–45, c. 80% female, rarely c. 50% female; corolla-lobes triangular, thickened apically; corolla of bisexual florets 5.5–7.5 mm long, 5-lobed;

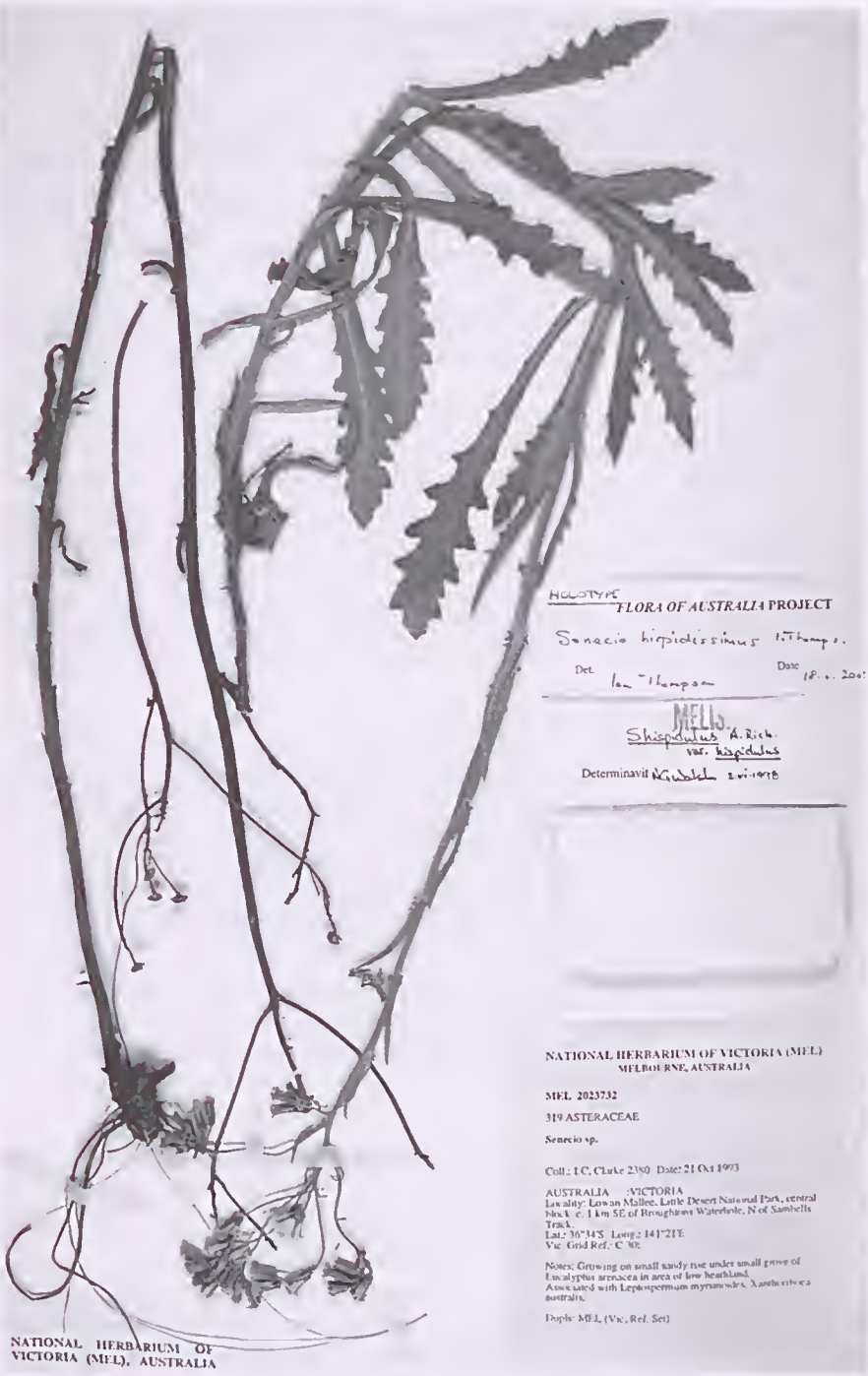
HOLOTYPE
FLORA OF AUSTRALIA PROJECT
Senecio hispidissimus I.Thomps.
Det. Ian Thompson
Date 18.10.2001
MELU
Shispidulus A.Rich.
var. hispidulus
Determinavit
NATIONAL HERBARIUM OF VICTORIA (MEL)
MELBOURNE, AUSTRALIA
MEL 2023732
319 ASTERACEAE
Senecio sp.
Coll.: I.C. Clarke 2380 Date: 21 Oct 1993
AUSTRALIA : VICTORIA
Locality: Lowan Mallee, Little Desert National Park, central block c. 1 km SE of Broughtons Waterhole, N of Sambells Track.
Lat.: 36°14'S Long.: 141°21'E
Vic. Grid Ref.: C 30
Notes: Growing on small sandy rise under small grove of Eucalyptus arenacea in area of low heathland.
Associated with Leptospermum myrsinoides, Xanthorrhoea australis.
Duplo MEL (Vic. Ref. Set)
NATIONAL HERBARIUM OF VICTORIA (MEL), AUSTRALIA

Figure 16. *Senecio hispidissiuus* (holotype: *I.C. Clarke 2380* MEL).

corolla-lobes of female florets 4, 0.2–0.3 mm long. *Achenes* narrow-obloid to narrow-ellipsoid, 1.5–2.8 mm long, tan or brown, with papillose hairs, in dense bands, l:w ratio of hairs c. 3–4. *Pappus* 6–7 mm long. (Fig. 16)

Flowers spring–autumn.

Distribution and Habitat: Occurs in far south-eastern Australia from Vivonne Bay, Kangaroo Island east to the Grampians in western Victoria, on Wilson's Promontory in south-central Victoria, and in Tasmania in the north-west, south-east, and on Bass Strait islands of the Furneaux Group (Fig. 12d). Grows in sandy soils in heathland, woodlands and shrublands in lowland areas.

Etymology: The epithet alludes to the indumentum of coarse hairs covering the stems and leaves, which is generally denser than in other species of this group (L: *hispidissimus*, most hispid).

Notes: Similar to *S. squarrosus* but more densely coarse-hairy, and with smaller capitula with usually fewer phyllaries. Similar to *S. hispidulus* but more densely coarse-hairy and with usually broader capitula and longer phyllaries that are purple or with an apical zone that is purple. A few collections from southern Victoria have narrower capitula with fewer florets and have stems less densely coarse-hairy than typical; these populations may differ from the typical form due to introgression with *S. hispidulus*. On the north-western coast of Tasmania a few collections have unusually short capitula and achenes. Further collections of these forms are desirable. All pieces on a sheet from K on which J.D. Hooker apparently based his *Erechtites arguta* var. *asper* Hook.f. appear to be this small-headed Tasmanian form.

Selected specimens examined: **SOUTH AUSTRALIA:** North of Bangham Scrub, *R.J. Bates 15675*, 3.x.1988 (AD); 1.46 km from Meningie at 145 degrees 48, *L.D. Williams 11483*, 21.ix.1980 (AD, CBG); Knotts Hill, *R.J. Bates 35502*, 5.xii.1993 (AD); Blackford, *M. Beek 107*, 4.x.1971 (AD); Section 120 (Lot 30), Hundred of Encounter Bay "Mt Alma", *P.J. Lang D8559*, 7.xii.1988 (AD). **VICTORIA:** 8 m. [13 km] SW of Dergholm PO, *A.C. Beauglehole 38071*, 16.xii.1971 (MEL); 6 m [10 km] NNW of Dergholm PO, Rocky Creek north of Baileys Rocks Reserve, *A.C. Beauglehole 37985*, 27.xi.1971 (AD, MEL); Discovery Bay Coastal Park, Swan Lake Rd, at intersection where road to lake turns S, *I.R. Thompson 738*, 1.i.2002 (MEL, CANB); Lower Glenelg National Park, Heath Rd south of Mt Deception Rd, *I.R. Thompson 744*, 2.i.2002 (MEL); The Grampians, Cassidy Gap near Dunkeld, *E. N.S. Jackson*, 29.x.1969 (AD); Lower Glenelg National Park, c. 400 m along unnamed track east of Heath Rd, *I.R. Thompson 743*, 2.i.2002 (AD, CANB, MEL). 10.7 km east Nelson along forest track through Lower Glenelg N.P, *M.E. Lawrence 1166*, 6.xii.1978 (AD). **TASMANIA:** Labillardiere Peninsula, Great Taylors Bay, South Bruny Island, *A.M. Buchanan 4029*, 6.xi.1984 (HO).

11. *Senecio multicaulis* A.Rich., in J.S.C. Dumont d'Urville, *Voy. Astrolabe* 2: 92, t. 34 (1834)

Type: [Western Australia], 'Crescit in Novae-Hollandiae loco vulgò dicto Port du Roi-Georges' [King George Sound], 1826–29, *A. Lesson*; holo: P.

Herbs to 1.5 m high. *Taproot or primary roots* well-developed; secondary roots not fleshy, c. 0.5 mm diam. *Stems* erect, coarse-hairy, sparsely appressed-cottony or nearly glabrous. *Leaves in middle third of stems* commonly becoming distinctly wider spaced and narrower upwards; leaves elliptic to very narrow-elliptic, narrow-ovate or very narrow-oblong to linear, 3–13 cm long, l:w ratio c. 2–10, not dissected or coarse-dentate to lobate; segments 1–5 per side extending along most of length, spreading or slightly antrorse, ±triangular; base attenuate or developing small auricles upwards, hardly amplexicaul; margin with occasional denticulations; upper surface sparsely to moderately scabridulous; lower surface often purple, with indumentum as for upper surface, or glabrous except for midrib, or cobwebby, or somewhat woolly. *Uppermost leaves* narrow-

elliptic or linear to narrow-linear, l:w ratio c. 3–30; base auriculate, auricles usually bidentate, slightly to moderately amplexicaul; indumentum sometimes woolly. *Unit inflorescences* of several to many capitula; total number of capitula per stem often 50–100; overtopping usually marked; mature lateral peduncles mostly 8–24 mm long. *Capitula*: ealycular bracteoles 6–10, 1.0–2.5 mm long; peduncle and margin of bracteoles ±glabrous or slightly cottony at anthesis; involucre 4.0–8.0 mm long, 2.0–2.8 mm diam.; phyllaries 12–14, glabrous, with apex erect; stereomes (in dried specimens) flat to moderately convex, green or rarely tinged purple, commonly minutely black at tip, occasionally also purple in a zone c. 1 mm long below tip; post-fructescence receptacle 3–4 mm diam., with phyllaries commonly finally erect. *Florets* 30–50, c. 70% female; corolla-lobes triangular, thickened apically; corolla of bisexual florets 5–8 mm long, 5-lobed; corolla-lobes of female florets 4 or 5, 0.2–0.3 mm long. *Achenes* narrow obloid, 1.5–2.5 mm long, red-brown, brown, or blackish, with papillose hairs in dense bands, l:w ratio of hairs c. 3. *Pappus* 5–7 mm long.

Flowers spring–summer

There are two subspecies:

Length:width ratio of mid to upper stem leaves (excluding auricles) mostly > 6; lower surface glabrous or indumentum sparse to moderate; involucre 5–8 mm long, l:w ratio c. 2.5–3.5 ..... **1a.** subsp. ***multicaulis***

Length:width ratio of mid to upper stem leaves (excluding auricles) mostly < 6; lower surface moderately to densely woolly; involucre 4–6 mm long, l:w ratio 2.0–2.5 ..... **1b.** subsp. ***stirlingensis***

11a. ***Senecio multicaulis*** A.Rich. subsp. ***multicaulis***

Senecio pusillus A.Rich., in J.S.C. Dumont d'Urville, *Voy. Astrolabe* 2: 99 (1834).

Type: [Western Australia], 'Creseit in Novae-Hollandiae loco vulgò dicto Port du Roi-Georges' [King George Sound], 1826–29, *A. Lesson*; holo: P.

Mid and upper stem leaves with l:w ratio 6–30, undissected with margin entire or dentate; lower surface glabrous, sparsely coarse-hairy, or cobwebby; involucre 5–8 mm long, 2.0–2.5 mm diam. (Figs 4c, 17)

Distribution and Habitat: Occurs in south-western Western Australia from Gin Gin north of Perth south to Walpole and south-south-east to the Stirling Ranges with a northern outlier at Geraldton and an eastern outlier at Cape le Grand National Park (Fig. 12e). Grows in sandy or sandy clay soils over granite or laterite in forest, heathland and woodland.

Notes: In recent Western Australian floras this taxon has been included under *Senecio hispidulus*. True *S. hispidulus* also occurs in Western Australia where it is much less widespread than *S. multicaulis* subsp. *multicaulis*. *Senecio hispidulus* has smaller capitula, leaves that are more deeply lobed, has well-developed coarse hairs which persist to the uppermost leaves, and lacks fine hairs. *Senecio multicaulis* subsp. *multicaulis* is variable in indumentum density and type; lower stem leaves are usually coarse-hairy but coarse hairs are commonly largely absent in mid to upper stem leaves, and sometimes replaced on the lower surface by a cobwebby indumentum. In these respects and to a lesser extent leaf shape, it is similar to *S. squarrosus* but S. *multicaulis* subsp. *multicaulis* has smaller and more numerous capitula. There is a tendency in this subspecies to flower intermittently (presumably moisture dependent) with branching from basal to mid stem axils frequently developing some time after the initial flowering, and these inflorescences typically greatly overtop the initial inflorescence. Hybridisation has been recognised as occurring between *S. multicaulis* subsp. *multicaulis* and the following three species: *S. hispidulus*, *S. diaschides* and *S. quadridentatus*.

Figure 17. *Senecio multicaulis* subsp. *multicaulis* (*V. Mann 22 & A.S. George* PERTH).

Selected specimens examined: **WESTERN AUSTRALIA:** Willyung Hill, 6 km north of Albany, *G.J. Keighery 5639*, 10.xi.1982 (PERTH); 20 km from Frankland to Cranbrook, *G.J. Keighery 6580*, 29.x.1983 (PERTH); Dardanup Forest Block, SE Bunbury, *G.J. Keighery 15140*, 13.x.1996 (PERTH); Site 13, down Ridley Road, 1.2 km SW Mount Billy, *M.G. Allen 958*, 13.xi.1996 (PERTH); Near Pt 5102, Kordabup Road, 4.3 km from South Coast Highway, 18 km west of Denmark, *A.R. Annels 1882*, 5.xi.1991 (PERTH); John Forest National Park near western boundary, c. 1.2 km SSE of Rocky Pool picnic area, *A. Markey 69*, 13.ix.1996 (PERTH); Scott National Park, Sunshine Ave, *C.J. Robinson 259*, 23.x.1990 (PERTH); Esperance Bay district, Neridup, ca. 3 km north-east of Howick Hill, in Location 251, *A.E. Orchard 1139*, 21.ix.1968 (AD, CANB).

11b. *Senecio multicaulis* subsp. ***stirlingensis*** I.Thomps., *subsp. nov.*

A subspecie typica foliis latioribus indumento inferne lanatiore, capitulis plerumque brevioribus differt.

Type: Western Australia, Mt Trio, Stirling Ranges, *G.J. Keighery s.n. & J.J. Alford*, 15 Sept. 1985; holo: PERTH.

Mid and upper stem leaves with l:w ratio 2–6, lobate or undissected with margin dentate; lower surface moderately to densely woolly, hairs coarse-based or not; involucre 4.0–6.0 mm long, 2.0–2.8 mm diam. (Fig. 18)

Distribution and Habitat: Occurs in far south-western Western Australia in the Stirling Ranges and the nearby Porongurup Ranges with an outlier further east at Pt Anne in Fitzgerald River National Park (Fig. 12f). Grows in soils derived from granite in woodland and forest.

Etymology: The epithet alludes to the fact that the subspecies is largely found in the Stirling Ranges and adjacent Porongorups in Western Australia.

Notes: Plants in the Stirling Ranges have leaves that are more conspicuously coarse-hairy and the hairs on the lower surface of its leaves are coarse (and obscured by the woolly overlay).

Selected specimens examined: **WESTERN AUSTRALIA:** Stirling Ranges National Park, Bluff Knoll, c. 0.5 km SSW from summit, beside walking track, *N.G. Walsh 5453*, 2.xi.2001 (MEL, PERTH); On walking track up east side of Devils Slide from the Pass at head of Bolganup Creek, ca. 200 m below summit; Porongorup Range, Porongorup National Park, *W.R. Barker 2380*, 14.ix.1977 (AD); Porongorup, *A. Meebold 1142*, Nov. 1928 (AD).

12. *Senecio glomeratus* Desf. ex Poir., *Encycl. Suppl.* 5: 130 (1817)

Type: probably cultivated, origin unknown; neo: FI (right hand specimen), *fide* R.O. Belcher, *Ann. Missouri Bot. Gard.* 43: 62 (1956).

Herbs to 2 m high. *Taproot* generally well developed; and prominent; secondary roots not or slightly fleshy, 0.5–1 mm diam. *Stems* erect or ascending to erect, moderately coarse-hairy, becoming sparsely coarse-hairy and/or appressed-cottony, or nearly glabrous upwards. *Leaves in middle third of stems* more or less evenly spaced and sized, elliptic to narrow-elliptic, 5–20 cm long, l:w ratio c. 2–7, coarse-dentate to deeply lobate, or rarely not dissected; segments 2–7 per side extending along most of length or confined to middle third, slightly antrorse, oblong, obovate, or triangular; base auriculate, with auricles dissected, semiamplexicaul; margin with scattered or rather frequent denticulations or teeth; both surfaces usually coarse-hairy but commonly coarse hairs sparse or absent above mid stem; lower surface green or sometimes tinged purple, above mid stem appressed woolly, cobwebby, or ±glabrous. *Uppermost leaves* narrow-elliptic, lanceolate, or linear, l:w ratio c. 3–10; dentate or margin appearing entire due to rolling. *Unit inflorescences* of many capitula; total number of capitula per stem often 50–300; overtopping variable; mature lateral peduncles mostly 4–13 mm long. *Capitula*: calycular

Figure 18. *Senecio multicaulis* subsp. *stirlingensis* (*G. Keighery s.n. & J.J. Alford* PERTH).

bracteoles 6–12, 1.0–3.0 mm long; peduncle and margin of bracteoles cobwebby to densely woolly at anthesis; involucre 3.0–6.0 mm long, 1.5–2.5 mm diam.; phyllaries predominantly 12–14, glabrous or slightly cobwebby basally, with apex erect; stereomes (in dried specimens) gently to moderately convex, green, black at tip, sometimes purple in a zone c. 1 mm long immediately below tip, sometimes entirely purple; mature receptacle 3–4 mm diam., with phyllaries finally erect. *Florets* 26–50, c. 80% female; corolla-lobes triangular, thickened apically; corolla of bisexual florets 3.5–6.5 mm long, 5-lobed; corolla-lobes of female florets 2–4, mostly 0.2–0.3 mm long; corolla-limb commonly deeper cleft on inner face. *Achenes* narrow obloid to narrow-ellipsoid, sometimes slightly clavate, 1.0–2.2 mm long, light to dark reddish-brown, sometimes olivaceous or green, especially marginal achenes, with papillose hairs, in lines or narrow bands, l:w ratio of hairs c. 3. *Pappus* 3.5–7 mm long.

Flowers mostly late spring–autumn.

Notes: Sometimes confused with *S. lispidulus* which has capitula of similar size. *Senecio lispidulus* differs from *S. glomeratus* by having more slender, always green and never cobwebby capitula containing fewer florets and on longer peduncles, fewer and generally shorter calycular bracteoles, and upper stem leaves that are at least slightly coarse-hairy and which generally do not develop a cobwebby or woolly indumentum. *Senecio hatlurstianus* also has capitula of similar-size but they too are never cobwebby basally.

There are two subspecies:

Achenes < one third of phyllary length (phyllaries 4.0–6.0 mm long; achenes 1.0–1.7 mm long), achenes commonly all medium to dark red-brown; pappus usually > 5 mm long.....**12a.** subsp. ***glomeratus***

Achenes > one third of phyllary length (phyllaries 3.0–5.0 mm long; achenes 1.3–2.2 mm long), marginal achenes greenish or olive, others medium brown; pappus usually < 5 mm long.....**12b.** subsp. ***longifructus***

12a. *Senecio glomeratus* Desf. ex Poir. subsp. ***glomeratus***

S. argutus A.Rich., in J.S.C. Dumont d'Urville, *Voy. Astrolabe* 1: 258 (1832), *nom. illeg. non* Kunth (1820); *Erechtites arguta* (A.Rich.) DC., *Prodr.* 6: 296 (1838); G. Bentham, *Fl. Austral.* 3: 659 (1867), *p.p.*; A. Ewart, *Fl. Victoria* 1180 (1931) *p.p.*

Type: 'Havre de l'Astrolabe, détroit de Cook' [Cook Strait, New Zealand]; holo: P.

E. arguta (A.Rich.) DC. var. *obovata* Hook.f., *Hooker's London J. Bot.* 6: 122 (1847). Type: none designated, annotated specimens at K, *fide* R.O. Belcher *op. cit.* 43: 64 (1956).

E. glomerata DC., *Prodr.* 6: 297 (1838), *nom. illeg.*; *E. arguta* (A.Rich.) DC. var. *glomerata* (DC.) Domin, *Biblioth. Bot.* 89: 684 (1930), as *Erechtliites* [specimen cited by Domin not seen; it was collected from Tambourine Mts, Queensland and is unlikely to be *S. glomeratus*]. Type: 'In Nova-Hollandia meridionali'; holo: G, *fide* R.O. Belcher, *op. cit.* 43: 61 (1956).

E. glomerata DC. var. *subincisa* DC., *Prodr.* 6: 297 (1838), *nom. illeg.* Type: 'In Nova-Hollandia', ex itin. Baudin; G, *fide* R.O. Belcher, *loc. cit.*

E. glomerata DC. var. *polycephala* DC., *Prodr.* 6: 297 (1838), *nom. illeg.* Type: 'in Nova-Zeelandia ad fretum Bass' [Bass Strait, New Zealand], *d'Urville*; G, *fide* R.O. Belcher, *loc. cit.*

S. lessonianus Sch.Bip., *Flora oder Allgemeine Bot. Zeitung* 28: 498 (1845), *nom. illeg. non* Steud. (1841). Type: ?not designated.

[*Erechtites arguta* (A.Rich.) DC. var. *dissecta auct. non* Benth.: J.M. Black, *Fl. S. Australia* 610 (1929)]

Figure 19. Distribution of a. *Senecio glomeratus* subsp. *glomeratus*; b. *S. glomeratus* subsp. *longifructus*; c. *S. extensus*; d. *S. laceratus*; e. *S. runcinifolius*; f. *S. longicollaris*.

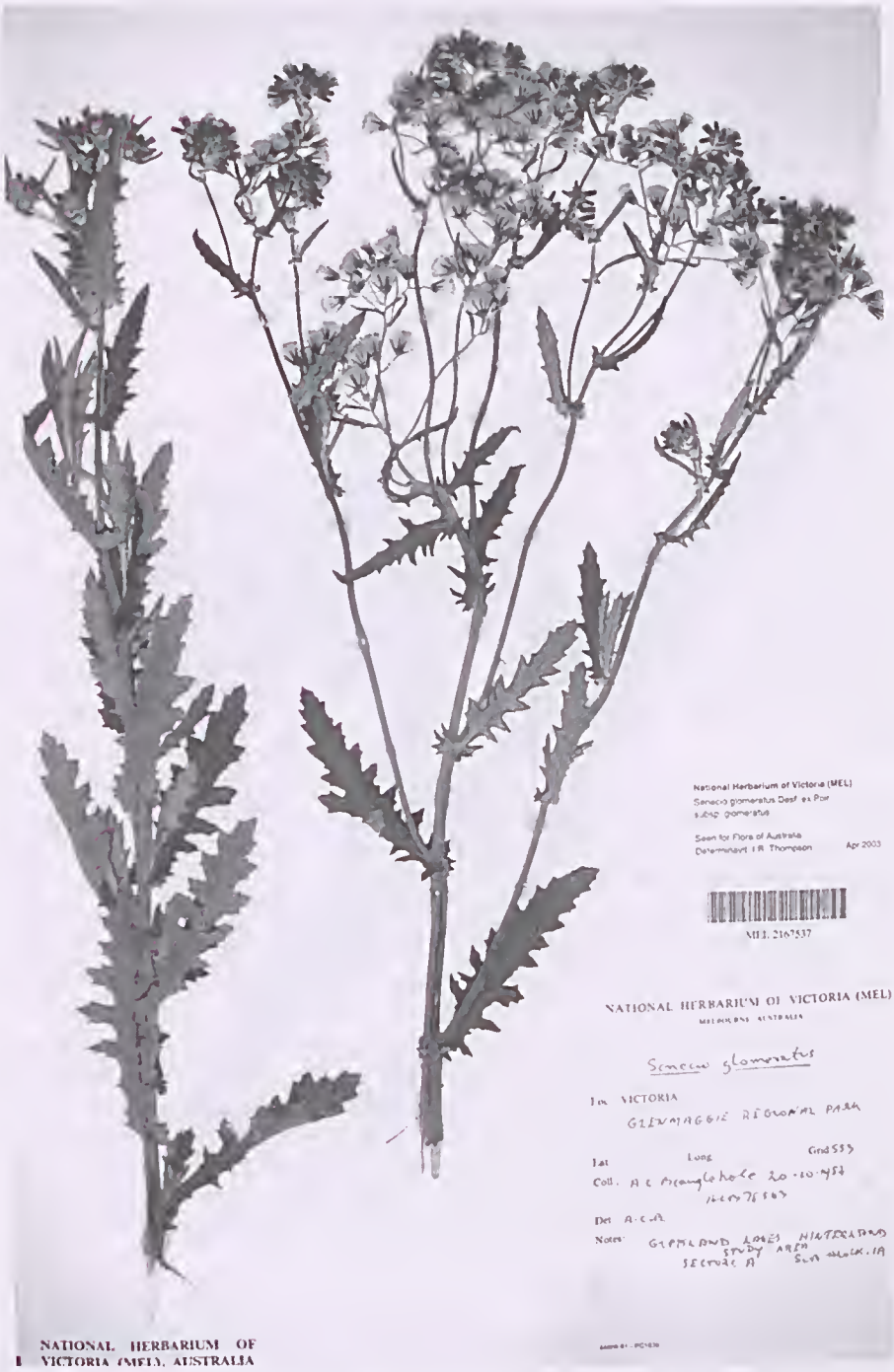

Figure 20. *Senecio glomeratus* subsp. *glomeratus* (*A.C. Beauglehole 78563* MEL).

Herbs to 2 m tall. *Lower surface of upper stem leaves* commonly whitish due to a moderately dense cobwebby indumentum. *Peduncles* and calyeular braeteoles somewhat densely cobwebby or woolly at anthesis; involuere 4.0–6.0 mm long, up to 3 times longer than broad; phyllaries often purple throughout. *Bisexual florets* 5–7 mm long; marginal florets 4–6 mm long. *Achenes* 1.0–1.7 mm long, usually all mid to dark reddish-brown, uncommonly some greenish. *Pappus* 5–7 mm long. (Figs 3d, 20)

Distribution and Habitat: Occurs in far south-western Western Australia from Scott National Park east to near Albany; in south-eastern Australia from Port Lincoln in south-central South Australia east to Buchan in eastern Victoria with more northern outliers in the Flinders Ranges in South Australia and at Mudgee in central-east New South Wales; and from the Furneaux Group of Islands south to South Bruny Island in Tasmania (Fig. 19a). Also native to New Zealand. Grows in a range of soil types in forest, woodland and heathland, sometimes adjaeent to water.

Notes: The numerous, crowded, small and often purple capitula surrounded basally by many cobwebby calyeular braeteoles give this subspecies a distinctive appearance. It is often a rather tall plant in forest environments. It sometimes grows near water and then is sometimes sympatric with subsp. *longifructus*. It is likely that hybridisation takes plaee between subspeeies in these environments.

Selected specimens examined: **WESTERN AUSTRALIA:** Farra Dam, 8 km west of Kojonup, *C. M. Lewis 455*, 10.x.1999 (PERTH). **SOUTH AUSTRALIA:** Southern Lofty, Kyeema corner, On Willunga to Meadows Road, *A.W. Bell 52*, 28.xi.1976 (AD, MEL). **VICTORIA:** Dundas River, 14 km NNW of Cavendish, *L.G. Adams 3876*, 27.xi.1981 (CANB, MEL); 2.5 km west of Whitfield on the Mansfield Road, *I.C. Clarke 2772*, 13.xi.1996 (CANB, MEL). **TASMANIA**: Yarra Creek Gorge, east coast of King Island, *J.H. Willis*, 6.iii.1966 (MEL); Birch's Bay, *L. Rodway 75*, 2.i.1931 (CANB).

12b. *Senecio glomeratus* subsp. ***longifructus*** I.Thomps., *subsp. nov.*

A subspecie typiea capitulis plerumque brevioribus modiee latioribus, aeheniis longioribus, pappo breviore differt.

Type: Victoria, Beloka Forest Block, 3.2 km SSE of Johnnies Top, Buenba Gap Rd, 6.2 km east of Beloka Range Track, *G.W. Carr 10286*, 12 Jan. 1985; holo: MEL; iso: AD.

?*Erechtites arguta* (A.Rieh.) DC. var. *microcephala sensu* J.M. Black, *Fl. S. Australia* 610 (1929).

Herb to 1.5 m tall. *Lower surface of upper stem leaves* eommonly nearly glabrous or weakly cobwebby, oecasionally moderately eobwebby. *Peduncles* and ealyeular bracteoles sparsely to moderately cobwebby at anthesis; involuere 3.0–4.5(–5) mm long, usually no more than c. twice as long as broad, phyllaries sometimes with an apieal purple zone c. 1 mm long, rarely entirely purple. *Bisexual florets* 4.5–5.5 mm long; marginal florets 3–4.5 mm long. *Achenes* 1.3–2.2 mm long, predominantly light to dark brown but usually a few to several marginal achenes olivaceous or green. *Pappus* 3.5–5 mm long. (Fig. 21)

Distribution and Habitat: Occurs in south-eastern Australia, from Kangaroo Is. in south-eastern South Australia east to Newton's Beach in far south-eastern New South Wales, and in Tasmania on eastern Bass Strait islands, in the Hobart area, at Welcome Inlet in the far north-west, and on the south-west coast at Ummarrah Creek(Fig. 19b). Grows adjacent to streams and swamps.

Etymology: The epithet alludes to the achenes of this subspeeies whieh are longer than in subsp. *glomeratus* (L: *longus*, long, and *fructus*, fruit).

Notes: Subsp. *longifructus* has shorter phyllaries, corollas, and a shorter pappus than subsp. *glomeratus*, but its eapitula are equally wide or wider and its achenes are longer.

MEL677202
NATIONAL HERBARIUM OF VICTORIA (MEL)
MELBOURNE AUSTRALIA
Senecio glomeratus Desf. ex Poiret
Family: COMPOSITAE
VICTORIA. Alpine Study Area, Baloka forest
Block. 3·2 km SSE of Johnnies Trp. Buenba
Gap Rd, 6·2 km E of Baloka Range Tk.
Quadrat No. 45229 Alt 940m
Lat. 36°46'41" Long. 147°55'26" Grid V42
Coll: G.W. Carr 10286 12 Jan 1985
Det G.W. Carr
Notes Occasional on swampy sites in forest.
Assoc spp: Eucalyptus radiata, E. nitida, E. camphora, Acacia melanoxylon, Carex appressa, Cyperus lucidus, Poa ensiformis.
AD
HOLOTYPE
FLORA OF AUSTRALIA PROJECT
Senecio glomeratus Desf. ex Poir
subsp. longifructus (F.Thomps.)
Det I.M. Thompson Date 18.x.2002
NATIONAL HERBARIUM OF VICTORIA (MEL), AUSTRALIA

Figure 21. *Senecio glomeratus* subsp. *longifructus* (holotype: *G.W. Carr 10286* MEL).

Generally speaking, it has a less dense indumentum on the calycular bracteoles, peduncles and lower surface of leaves. It also tends to be a shorter plant and appears to more consistently associated with water. Inflorescences generally have fewer and less congested capitula and overtopping is more pronounced. The involucre of capitula are less commonly all purple although this may be simply because it is more often in shaded environments.

Hybridisation between either *S. hispidulus* and *S. minimus* and either of the two subspecies is likely and it may be difficult to distinguish such hybrids from subsp. *longifructus*. However, as *S. hispidulus* and *S. minimus* have narrower capitula than *S. glomeratus*, one would expect any hybrid to have capitula noticeably narrower than those of subsp. *longifructus*.

Hybridisation between the two subspecies is likely as they can occupy similar habitats, and this is a probable reason for difficulties in assigning some specimens to either subspecies. Regions where intermediate specimens have been collected include the Furneaux Group of Islands in Bass Strait, and on the Fleurieu Peninsula of South Australia.

Selected specimens examined: **SOUTH AUSTRALIA:** Marsh's Swamp area, *I.B. Wilson 835*, 13.vii.1968, (AD); Carpenter Rocks, *A.G. Spooner 5567*, 6.xi.1977 (AD). **VICTORIA:** Nadgee Nature Reserve; Newtons Beach, *D.E. Albrecht 1500*, 21.i.1985 (MEL). **VICTORIA:** Flat on Beynon's Creek at bridge, Morgan's Mill, 7 km (direct) NW of Erica, *N.H. Scarlett 84-177*, 3.iii.1984 (AD); Upper Delegate River, east branch above "The Forks", 10.5 km (direct) SSW of Bendoc, *N.H. Scarlett 84-130*, 17.ii.1984 (AD); East Gippsland, Ewing Marsh Wildlife Reserve, end of Beach Road, *J.V. Yugovic 374*, 28.xi.1987 (MEL). **TASMANIA:** Near mouth of Welcome Inlet, *A.M. Buchanan 9081*, 28.xii.1986 (HO); Furneaux Group, Gull Island, Just east of main northern outcrop, *J.S. Whinray 8545* (HO, MEL); South Esk, *Miss Oakden*, 1887 (MEL).

13. *Senecio exteusus* I.Thomps., *sp. nov.*

A *S. glomerato* Desf. ex Poir. planta brevi, caulibus sine pilis grossis, capitulis majoribus, bracteolis longioribus, acheniis glabris differt.

Type: Victoria, Alpine National Park, Howitts Plain, south end, *I.R. Thompson 629, N.G. Walsh & A. Tolsma*, 22 Jan. 2001; holo: MEL; iso: BRI, CANB, HO, NSW.

Senecio sp. 1 *sensu* N.G. Walsh, *Fl. Victoria* 4: 961 (1999).

Herbs to 0.5 m high. *Roots* unknown. *Stems* ascending to erect, sparsely to moderately appressed-cottony, glabrescent. *Leaves in middle third of stems* often becoming distinctly wider spaced and narrower upwards, oblanceolate or spathulate, 5–12 cm long, l:w ratio c. 4–9, lobate or less often not dissected; segments 3–5 per side, occurring in distal two-thirds, antrorse, triangular, oblong, or obovate; base attenuate to cuneate; margin with occasional denticulations or teeth; both surfaces glabrous or scabridulous and/or slightly cobwebby; lower surface green. *Uppermost leaves* very narrow-elliptic, l:w ratio c. 5–10, lobate to deeply lobate; base commonly auriculate, with auricles dissected, slightly amplexicaul. *Unit inflorescences* of several to many capitula; total number of capitula per stem often 20–60; overtopping variable; mature lateral peduncles mostly 5–20 mm long. *Capitula*: calycular bracteoles 6–8, (2.0–)3.0–5.0 mm long; peduncle and margin of bracteoles often slightly cobwebby at anthesis (moderately so shortly prior to anthesis); involucre 5.0–7.0 mm long, c. 1.8–2.0 mm diam.; phyllaries 12–14, glabrous or nearly so, with apex erect; stercomes (in dried specimens) ±flat, green or partially purple, black at tip, sometimes purple in a zone c. 1 mm long below tip; post-fructescence receptacle 3–3.5 mm diam., with phyllaries commonly finally erect. *Florets* 30–45, c. 80% female; corolla-lobes triangular, slightly thickened apically; corolla of bisexual florets 5–6 mm long, 4- or 5-lobed; corolla-lobes of female florets 3 or 4, c. 0.2 mm long. *Achenes* narrow obloid to narrow oblong-ellipsoid, 2.0–2.2 mm long, red-brown, lustrous, glabrous. *Pappus* 5–6 mm long. (Figs 3f, 22)

NATIONAL HERBARIUM OF VICTORIA (MEL)
MELBOURNE, AUSTRALIA
MEL 2173067
ASTERACEAE
Senecio extensus I.Thomps.
HOLOTYPE
Coll: Thompson, I.R. 629 Date: 22 Feb 2001
Addit. Coll: Walsh, N.G.
AUSTRALIA VICTORIA
Region/District: Snowfields
Locality: Hewitt's Plain, S. end, Alpine National Park.
Lat: 37°14'11"S Long: 146°41'50"E
Vic. Grid Ref.: S 17.
Notes: Grassland/open heathland. Associated species include Senecio gunnii, Hovea montana, Craspedia coolamunica. Plant to 40 cm tall, several stems from base
Det: Thompson, I.R. 17 May 2003
Dupls: BRI, CANB, HO, NSW
HOLO-
TYPE
NATIONAL HERBARIUM OF

Figure 22. *Senecio extensus* (holotype: *I.R. Thompson 629* MEL).

Flowers mid-summer–autumn.

Distribution and Habitat: Occurs in south-eastern Australia from Kiandra in far south-eastern New South Wales south-west to Howitt Plains in eastern Victoria with a disjunct occurrence in north-eastern New South Wales at Barrington Tops (Fig. 19e). Grows in grasslands/herbfields or open shrublands in subalpine areas.

Etymology: The epithet alludes to the long calycular bracteoles, which extend over the involucre to a greater extent than other disciform species (L: *extensus*, extended).

Notes: Readily distinguished by its long calycular bracteoles and glabrous, lustrous achenes. Some populations in the Southern Tablelands of New South Wales have slightly shorter bracteoles and/or narrower heads.

Selected specimens examined: **NEW SOUTH WALES:** Kosciuszko National Park, Long Plain, c. 200 m SW from confluence of Murrumbidgee R and Boundary Ck, *N.G. Walsh 5511*, *K. McDougall & J. Walsh*, 11.xii.2001 (MEL); Kosciuszko National Park, Long Plain, near confluence of Murrumbidgee R and Boundary Ck, *I.R. Thompson 746 & N.G. Walsh*, 31.i.2002 (MEL, NSW); Mt Kosciuszko, nr summit, *coll. unknown*, Jan 1898 (MEL); Kosciuszko National Park, 1 km ESE from Happys Hut, near crossing of Happy Jacks Creek by 4WD track, *N.G. Walsh 4891*, *K. McDougall & G. Wright*, 9.xii.1998 (MEL). **VICTORIA:** Snowy Range airstrip, *S. J. Forbes 1953*, 28.i.1984 (MEL, NSW); East Gippsland, The Playground below Cobberas No. 1, *A.C. Beauglehole 36712*, 9.ii.1971 (MEL); Bogong High Plains, Buckety Plain, *A.C. Beauglehole 15746*, 28.i.1966 (MEL); Dargo High Plains, *J. Strudwick 782*, 17.i.1990 (MEL). **TASMANIA:** Mackenzies Tier, *A. Moscal 6394*, 22.ii.1984 (HO).

14. *Senecio laceratus* (F.Muell.) Belcher, *Ann. Missouri Bot. Gard.* 43: 51 (1956)

Erechtites lacerata F.Muell., *Linnaea* 25: 417 (1853).

Type: [South Australia], Cudnaka River [Kanyaka R., Flinders Ranges], *F. Mueller*; holo: MEL.

E. arguta sensu G. Bentham, *Fl. Austral.* 3: 659 (1867), *p.p. min.*

Herbs to 1 m high. *Taproot* well-developed; secondary roots fine. *Stems* erect or sprawling, ±glabrous; secondary and tertiary branching often relatively well-developed. *Leaves in middle third of stems* more or less evenly spaced and sized, elliptic to narrow-elliptic, 8–20 cm long, l:w ratio c. 2–3, not dissected or coarse-dentate to lobate; segments 3–7 per side, predominantly in proximal two-thirds, antrorse, roughly triangular; base truncate to shallowly cordate, sometimes slightly amplexicaul; margin with rather frequent denticulations, serrations or teeth, apex acuminate; both surfaces ±glabrous; lower surface green. *Uppermost leaves* narrow-elliptic, narrow-oblong or lanceolate, l:w ratio c. 3–4. *Unit inflorescences* of several to many capitula; total number of capitula per stem commonly 30–100; overtopping marked; mature lateral peduncles mostly 5–12 mm long. *Capitula*: calycular bracteoles 3–6, 1.0–2.0 mm long; involucre 4.0–5.0 mm long, 1.8–2.0 mm diam.; phyllaries 12–14, glabrous, with apex erect; stereomes (in dried specimens) moderately convex, green, minutely black at tip; post-fructescence receptacle 3–3.5 mm diam., with phyllaries commonly finally erect. *Florets* 30–40, c. 80% female; corolla-lobes triangular, hardly thickened apically; corolla of bisexual florets 5–6 mm long, 5-lobed; corolla-lobes of female florets 4 or 5, c. 0.3 mm long. *Achenes* ±narrow-obloid, 1.8–2.2 mm long, dark brown, with papillose hairs, in bands or more or less evenly scattered, l:w ratio of hairs c. 3. *Pappus* 3–4 mm long. (Fig. 23)

Flowers most of year (rainfall dependent).

Distribution and Habitat: Occurs in central Australia extending from the Dulcie Ranges in southern Northern Territory south-west to the Rawlinson Range in central-eastern Western Australia and south-south-west to Mt Illbillie in north-western South Australia, and in eastern South Australia from Weetootla Gorge south to Telowie Gorge

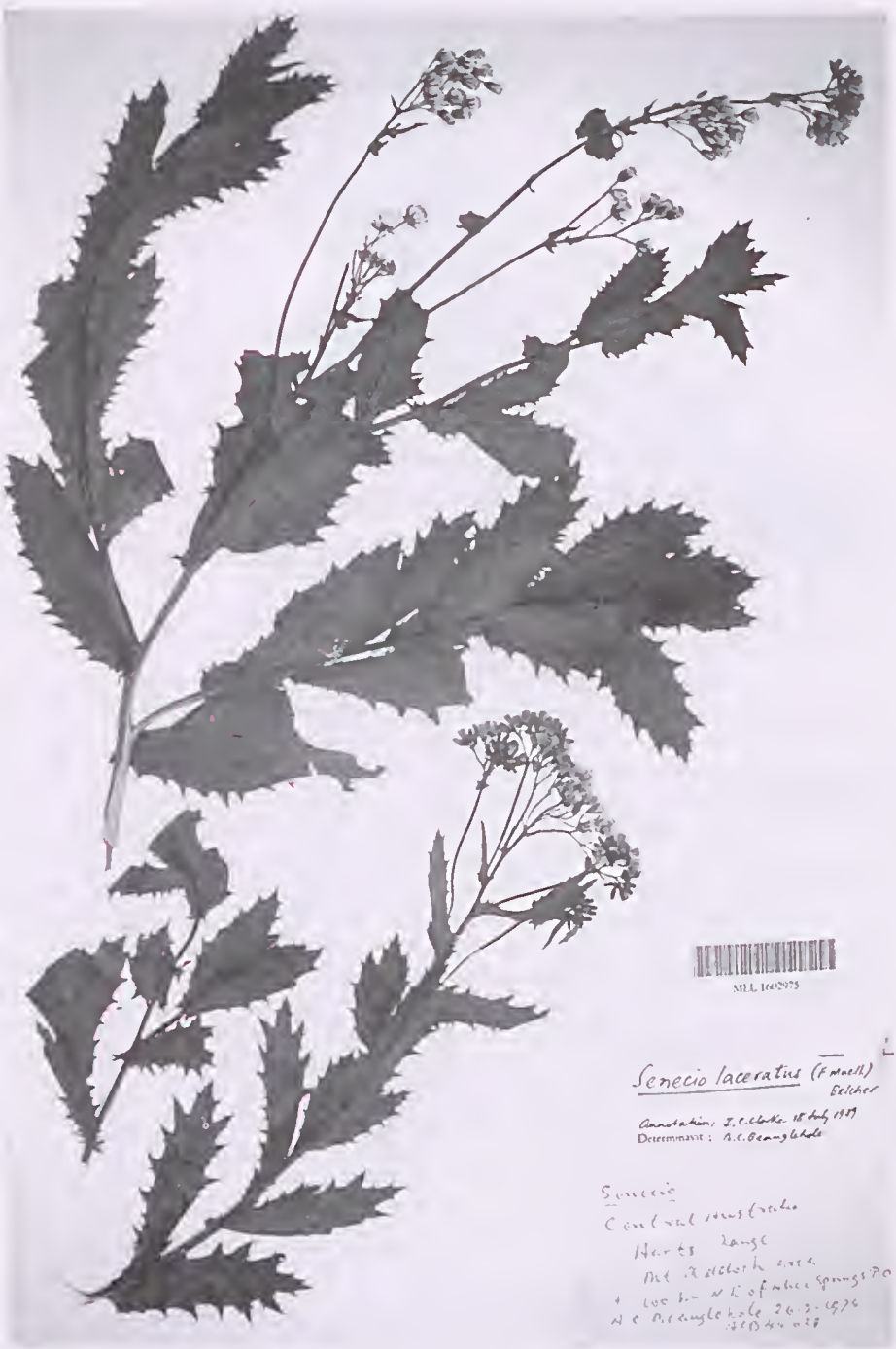

Figure 23. *Senecio laceratus* (*A.C. Beauglehole 44628* MEL).

in the Flinders Ranges with an outlier at Mt Finke further west (Fig. 19d). Grows on rocky slopes usually in shaded seepage areas, and/or adjacent to water in skeletal, sandy or gravelly soils of sandstone, or quartzite derivation in open woodland.

Notes: *Senecio laceratus* extends further north in Central Australia than any other disciform species. The leaves are distinctive in that the apex of segments and teeth are usually markedly acuminate. It appears to grow as an annual under normal conditions. Secondary and tertiary branching is usually well-developed, contingent on moisture availability, a characteristic it shares with *S. runcinifolius*. In capitular and achenial morphology it is very similar to *S. bathurstianus*.

Selected specimens examined: **WESTERN AUSTRALIA:** Pass in Blackstone Range, *A.S. George 8755*, 17.vii.1967 (PERTH). **NORTHERN TERRITORY:** Reedy Creek, George Gill Range, *G. Chippendale*, 14.viii.1957 (AD, CANB, DNA, MEL, PERTH). **SOUTH AUSTRALIA:** Everard Ranges, Victory Well. Mt Illbillee. *D. Kraehenbuehl 5126*, 5.ix.1968 (AD).

15. *Senecio runcinifolius* J.H.Willis, *Proc. Roy. Soc. Queensland* 62: 106, t. 7 (1952).

Type: [South Australia] Moorundee near Blanchetown, Murray River, *F. Mueller*, Feb. 1851; holo: MEL.

Erechtites picridioides Sond., *Linnaea* 25: 523 (1853), *nom. illeg. non* Turcz. (1851). Type: State uncertain, 'Murray'; holo: MEL.

[*Erechtites mixta auct. non* (A.Rich.) DC.: G. Bentham, *Fl. Austral.* 3: 659 (1867); J.M. Black, *Fl. S. Australia* 610 (1929); A. Ewart, *Fl. Victoria* 1179 (1931)]

Herbs to 1.2 m high. *Taproot* usually well-developed; secondary roots slightly fleshy, c. 1 mm diam. *Stems* erect, glabrous or nearly so; secondary and tertiary branching often well-developed. *Leaves in middle third of stems* more or less evenly spaced and sized, narrow-elliptic to narrow-lanceolate, 7–20 cm long, l:w ratio c. 2.5–6, deeply lobate to sub-pinnatisect, petiole-like basally; segments 4–8 per side in middle third, predominantly retrorse, roughly triangular; base attenuate; margin with scattered denticulations or teeth; upper surface ±glabrous; lower surface green or purple, sparsely coarse-hairy or glabrous. *Uppermost leaves* similar but petiole-like portion shorter. *Unit inflorescences* of several to many capitula; total number of capitula per stem often 20–100; overtopping variable; mature lateral peduncles mostly 8–25 mm long. *Capitula*: calycular bracteoles 3–6, 2.0–3.0 mm long; peduncle and margin of bracteoles ±glabrous or receptacle cobwebby at anthesis; involucre 7.0–11.0 mm long, 1.5–2.5 mm diam.; phyllaries 12–14, glabrous, with apex erect; stereomes (in dried specimens) ±flat, green or tinged purple, sometimes black at tip, rarely with a purple zone immediately below tip; post-fruetescence receptacle 3–5 mm diam., with phyllaries commonly finally spreading. *Florets* 40–60, c. 80% female; corolla-lobes triangular, not or slightly thickened apically; corolla of bisexual florets 8–11 mm long, 4- or 5-lobed; corolla-lobes of female florets 3 or 4, c. 0.1 mm long. *Achenes* narrow oblong-ellipsoid, 2.5–3.0 mm long, pale brown, with papillose hairs in narrow bands, l:w ratio of hairs c. 3. *Pappus* 8–13 mm long. (Figs 2f, 24)

Flowers mostly winter–spring, also other times of year (moisture dependent).

Distribution and Habitat: Occurs in central and south-eastern Australia extending from the Lake Eyre basin in South Australia east to Gilruth Plains in far south-western Queensland and south-east to Melbourne in south-central Victoria (Fig. 19e). Grows on margin of swamps, lakes, or in seasonally damp sites on heavy soils on lowland plains.

Notes: A plant of inland floodplains distinctive by virtue of its runcinate leaves. The showy display of the relatively long pappus-bristles at fruit maturity is also a feature of this plant. Hybrids with *S. quadridentatus* have been recorded.

Selected specimens examined: **SOUTH AUSTRALIA:** East of Flinders Range. Koonamore (ca. 60 km north of Yunta, *Hj. Eichler 12422*, 13.vii.1956 (AD). **QUEENSLAND:** Warrego district.

MEL 2011156
NATIONAL HERBARIUM OF VICTORIA (MEL)
MELBOURNE, AUSTRALIA
MEL 2011156
319 ASTERACEAE
Senecio runcinifolius J.H. Willis
Coll.: I. Thompson 39 Date: 7 Oct 1991
AUSTRALIA :VICTORIA
Locality: Murray Valley district. Bend of Broken Creek and beside Katamatite Road, 3 km E of Numurkah.
Lat.: 36°06'S Long.: 145°28'E
Vic. Grid Ref.: M 9 :
Notes: Growing in swampy area.
Tall plant growing in several dense clumps with c. 100 stems per clump.
Associated species notably Typha orientalis.
Duplc NSW
NATIONAL HERBARIUM OF VICTORIA (MEL), AUSTRALIA

Figure 24. *Senecio runciuifolius* (*I.R. Thompson 39* MEL).

Lake Bindegolly, east of Thargomindah on road to Eulo, *R.J. Chinnock 6249*, 25.ix.1984 (AD, MEL). **NEW SOUTH WALES:** 16 km north of Booroorban and 74 km north of Deniliquin, *M.D. Crisp 1709*, 25.xi.1975 (CBG, NSW); Barwon R., Collarenebri, *R.G. Coveny 12667, P. Cuneo, & B. Wiecek*, 22.viii.1987 (AD, BRI, MEL, NSW). **VICTORIA:** Lake Watchem Reserve, *A.C. Beauglehole 85027*, 8.x.1986 (AD, MEL).

16. *Senecio longicollaris* I.Thomps., *sp. nov.*

A *S. quadridentato* Labill. caulibus glabris, foliis latioribus inferne hispidis, capitulis latioribus plerumque lanatioribus, acheniis plerumque longioribus differt.

Type: Victoria, beside road to Lake William Hovell, c. 4 km SW of Cheshunt, *I.R. Thompson 720*, 29 Nov. 2001; holo: MEL; iso: CANB.

Herbs to 1.8 m high. *Taproot* reduced; secondary roots fleshy, 1–2 mm diam. *Stems* erect, glabrous or sparsely appressed-cottony, glabrescent. *Leaves in middle third of stems* more or less evenly spaced and sized, very narrow-elliptic, 8–24 cm long, l:w ratio c. 4–12, not dissected; base attenuate or with small, entire auricles; margin with moderately frequent denticulations; upper surface sparsely appressed-cottony, glabrescent; lower surface green, sparsely to moderately coarse-hairy, with hairs short, sometimes only cobwebby. *Uppermost leaves* similar; base cuneate. *Unit inflorescences* of many capitula; total number of capitula per stem often 30–100; overtopping marked; mature lateral peduncles mostly 10–25 mm long. *Capitula*: calycular bracteoles 4–8, 1.0–2.0 mm long; peduncle and margin of bracteoles somewhat woolly at anthesis; involucre 7.0–9.0 mm long, 2.0–3.0 mm diam.; phyllaries mostly 12–14, cobwebby or sometimes nearly glabrous, with apex erect; stereomes (in dried specimens) ±flat, green or tinged purple, sometimes minutely black at tip; post-fructescence receptacle 3–3.5 mm diam., with phyllaries commonly finally reflexed. *Florets* 30–50, c. 80% female; corolla-lobes triangular, slightly thickened apically; corolla of biscxual florets 6–8 mm long, 5-lobed; corolla-lobes of female florets 3 or 4, c. 0.2 mm long. *Achenes* lageniform, usually extremely attenuate apically, 4.0–6.0 mm long, brown, with papillose hairs scattered in lines, l:w ratio of hairs c. 1–2. *Pappus* 6–7 mm long. (Figs 4h, 25)

Flowers all year round, mostly summer–autumn.

Distribution and Habitat: Occurs in far south-eastern Queensland (all records old), central-eastern and south-central New South Wales (Booligal and Wanganella), in north-central Victoria from Porepunkah west to the Barmah Forest, and in far south-eastern South Australia at Lake Alexandrina. Grows on floodplains and by water in forest, woodland and shrubland (Fig. 19f).

Etymology: The epithet alludes to the long-necked achenes (L: *longus*, long, and *collaris*, of the neck).

Notes: Similar to *Senecio glandulosus* but with broader leaves that are often coarse-hairy on the lower surface, larger capitula, phyllaries that are more densely cobwebby, and longer, and particularly longer-necked, achenes. The achenes of *S. tasmanicus* are like those of *S. longicollaris* but the former is smaller, has smaller leaves that are crowded basally at anthesis and the capitulum is more or less glabrous at anthesis. Specimens from southern Queensland and coastal New South Wales tend to have shorter capitula with the indumentum relatively sparse, leaves with a higher length:width ratio, and with larger denticulations. Further collections to better characterise these poorly collected, more northern populations is desirable.

Selected specimens examined: **SOUTH AUSTRALIA:** Millowar, *D.E. Murfet 2647 & R.L. Taplin*, 20.iv.1997 (AD). **QUEENSLAND:** Main Range between Spring Bluff and Murphy's Creek, *C.T. White 7021*, 2.viii.1930 (BRI); Gladfield, *C.J. Gwyther* (BRI). **VICTORIA:** Lake Wm. Hovell near Cheshunt - bushland area south of lake, *J. Strudwick JS827*, 14.ii.1990 (MEL); 13.6 km SW from Porepunkah new bridge to SE corner of extended Mt Buffalo National Park via

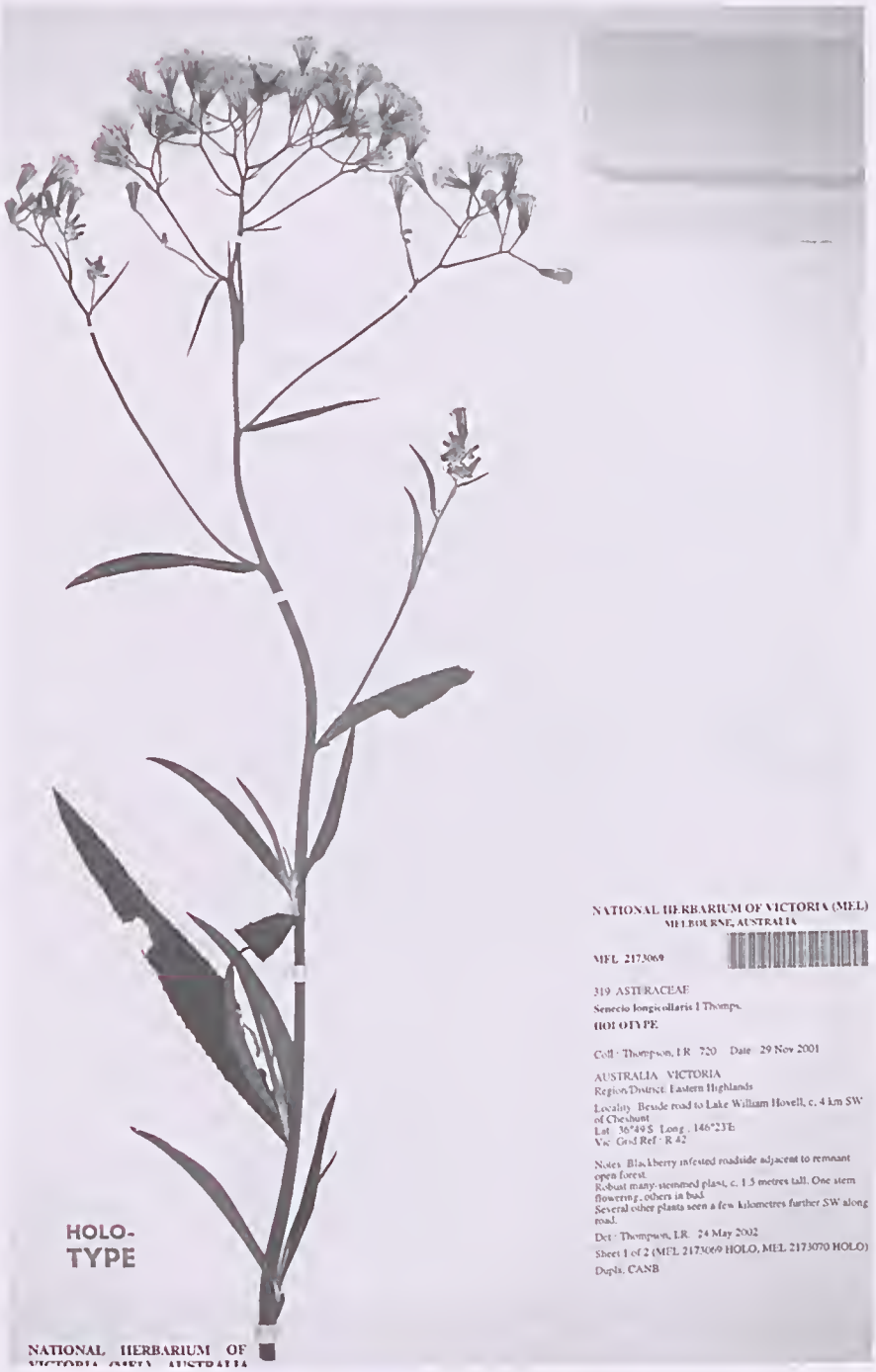
NATIONAL HERBARIUM OF VICTORIA (MEL)
MELBOURNE, AUSTRALIA
MEL 2173069
319 ASTERACEAE
Senecio longicollaris I.Thomps.
HOLOTYPE
Coll: Thompson, I.R. 720 Date: 29 Nov 2001
AUSTRALIA VICTORIA
Region/District: Eastern Highlands
Locality: Beside road to Lake William Hovell, c. 4 km SW of Cheshunt
Lat: 36°49'S Long: 146°23'E
Vic. Grid Ref.: R 42
Notes: Blackberry infested roadside adjacent to remnant open forest.
Robust many-stemmed plant, c. 1.5 metres tall. One stem flowering, others in bud.
Several other plants seen a few kilometres further SW along road.
Det: Thompson, I.R. 24 May 2002
Sheet 1 of 2 (MEL 2173069 HOLO, MEL 2173070 HOLO)
Dupls. CANB
HOLO-
TYPE
NATIONAL HERBARIUM OF

Figure 25. *Senecio longicollaris* (holotype: *I.R. Thompson 720* MEL).

Buckland River bridge – 300 m up Buffalo creek from the river, *N.T. Rossiter & A. Piesse 862*, 20.v.1987 (MEL); Lake Waringa, *Dallachy* (MEL); Barmah Forest, east end, Sandspit Creek area just south of Murray River, *I.R. Thompson 689*, 30.ix.2001 (MEL); Beside road to Lake William Hovell, c. 4 km SW of Cheshunt, *I.R. Thompson 754 & N.G.Walsh*, 1.ii.2001 (AD, MEL, NSW); Broken Creek, c. 4 km east of Numurkah, *I.R. Thompson 768*, 10.vii.2002 (MEL); Lake Nhill, south edge of Nhill, c. 1 km SE of Nhill P.O., *A. Paget 2457*, 19.x.1996 (MEL).

17. *Senecio tasmanicus* I.Thomps., *sp. nov.*

A *S. quadridentato* Labill. indumento eaulis sparsiore, foliis inferiore pilis grossis instrueti, peduneulis et eapitulis glabris, aeheniis longioribus differt; a *S. macrocarpo* Belcher capitulis tenuioribus, papillis acheniorum paucioribus differt.

Type: Tasmania, *Archer*, date unknown; holo: NSW 27852 [exeluding piece on far left which is *S. prenanthoides* A.Rieh.]

Herbs to 0.4 m high. *Taproot* ineonspicuous; seeondary roots fleshy, to c. 1.5 mm diam. *Stems* erect, sparsely appressed-cottony or nearly glabrous. *Leaves in middle third of stems* beeoming distinetly wider spaced and narrower upwards, oblanecolate to very narrow-elliptic, 3–8 cm long, l:w ratio c. 6–15, not disseeted or coarse-dentate; segments 2–4 per side in middle third, spreading, triangular; base attenuate; margin with scattered dentieulations or teeth: upper surfaee sparsely seabridulous or nearly glabrous; lower surface green with seattered short, coarse hairs, often with a eobwebby overlay. *Uppermost leaves* narrow-linear, l:w ratio e. 15–30, not dissected; base sometimes with very small, entire auricles; surfaees sparsely eobwebby or glabrous. *Unit inflorescences* of several eapitula; total number of capitula per stem c. 8–20; overtopping not marked; mature lateral peduncles mostly 20–50 mm long. *Capitula*: ealyeular bracteoles 3–6, 2.0–4.0 mm long; pedunele and margin of bracteoles glabrous or nearly so at anthesis; involucre 9.0–11.0 mm long, 2.0–2.4 nim diam.; phyllaries 12–16, glabrous, with apex erect; stereomes (in dried specimens) ±flat, green or partially purple, minutely black at tip, sometimes purple in a zone c. 1 mm long immediately below tip; post-fructescence receptacle not seen. *Florets* 40–60, c. 75% female, eorolla-lobes e. triangular, hardly thickened apically; eorolla of bisexual florets 6.5–8 mm long, 4- or 5-lobed; eorolla-lobes of female florets 3 or 4, e. 0.1 mm long. *Achenes* lageniform, 5.0–7.0 mm long, neck 2–3 mm long, light brown, with papillose hairs scattered in lines, l:w ratio of hairs c. 1–2. *Pappus* e. 7 mm long. (Fig. 27)

Flowers late spring–summer.

Distribution and Habitat: Occurs in Tasmania but not reeorded since the mid 1800s and possibly extinet (Fig. 26a). Likely to grow in lowland plains near swamps.

Notes: A species previously overlooked and it is likely that its habitat has been destroyed by land clearing since that period. It has similarities with *S. longicollaris* in terms of achene morphology in particular but also similar in leaf and stem indumentum. Also, similar to *S. dolichocephalus* in habit and capitular dimensions and similar to *S. macrocarpus* in capitulum length (but not width) and in having inflorescences of few capitula.

Selected specimens examined: **TASMANIA**: Formosa, *Gunn 508* (NSW; left hand specimen).

18. *Senecio glandulosus* (DC.) Sch.Bip., *Flora oder Allgemeine Bot. Zeitung* 28: 498 (1845)

Erechtites glandulosa DC., *Prodr.* 6: 295 (1838); *E. quadridentata* var. *glandulosa* (DC.) Domin, *Biblioth. Bot.* 89: 685 (1930), as *Erechthites*.

Type: [New South Wales], 'ad ripas flum. Lachlan in Nova-Hollandia interiore' [Lachlan River], *A. Cunningham 141*; G (microfiehe seen MEL).

Figure 26. Distribution of a. *Senecio tasmanicus*; b. *S. glandulosus*; c. *S. glabresceus*; d. *S. quadridentatus*; e. *S. dolichocephalus*; f. *S. queenslandicus*.

Figure 27. *Senecio tasmanicus* (holotype: *Archer* NSW 27852, excluding piece on far left).

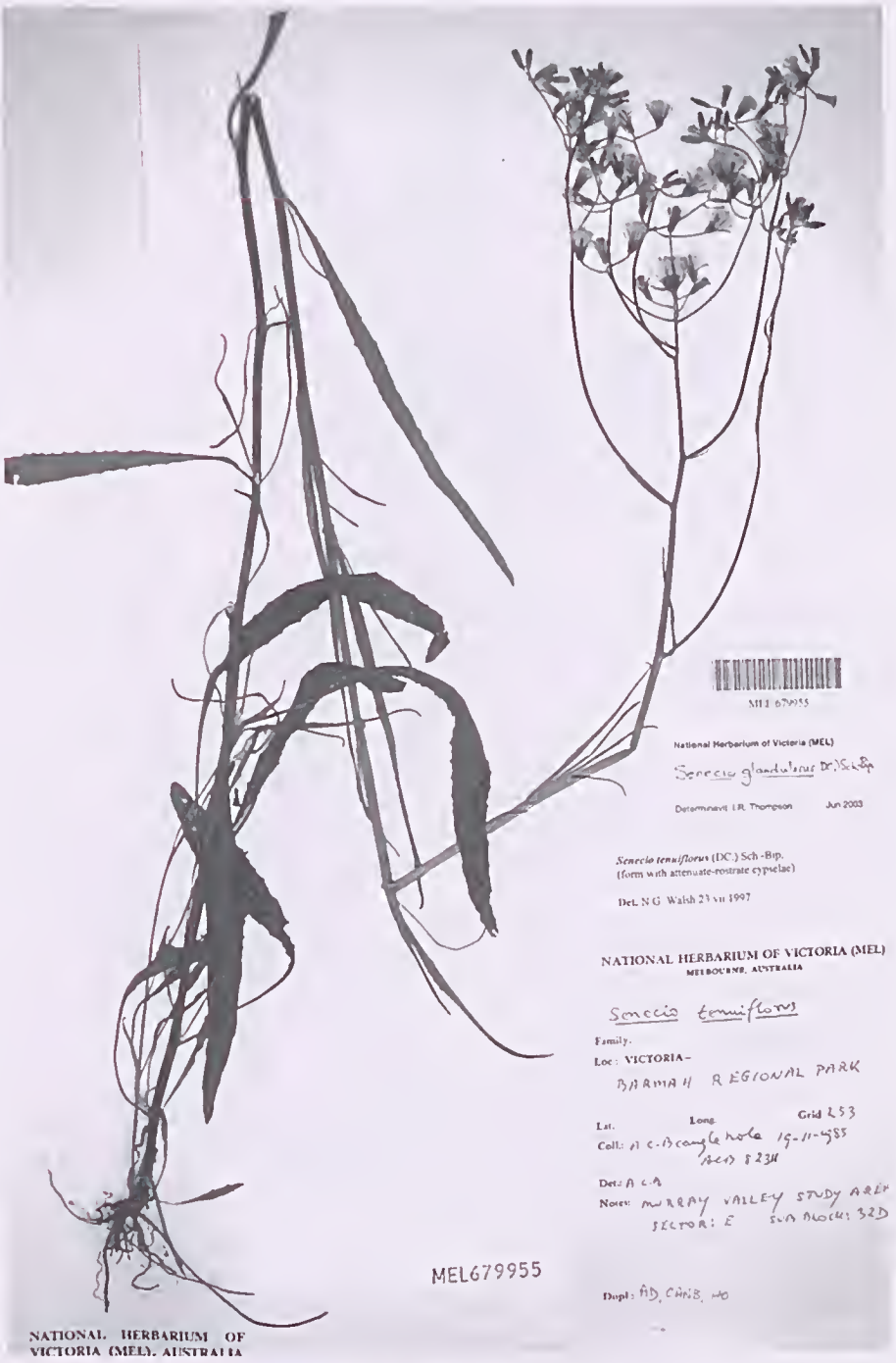

Figure 28. *Senecio glandulosus* (*A.C. Beauglehole 82311* MEL).

Herbs to 1.5 m high. *Taproot* inconspicuous; secondary roots fleshy, 1–2 mm diam. *Stems* ereet, sparsely appressed-cottony, glabreseent. *Leaves in middle third of stems* more or less evenly spaeed and sized, very narrow-elliptie to linear, 10–24 em long, l:w ratio c. 12–16, not dissected; base attenuate; margin usually minutely denticulate; surfaees ±glabrous or sparsely appressed-eobwebby, glabrescent. *Uppermost leaves* sometimes developing small, entire aurieles, hardly amplexieaul. *Unit inflorescences* of many capitula; total number of capitula per stem often 30–100; overtopping slight to moderate; mature lateral peduneles mostly 6–25 mm long. *Capitula*: ealycular bracteoles 4–8, 1.0–2.0 mm long; peduncle and margin of bracteoles moderately cobwebby at anthesis; involucre 5.0–8.0 mm long, 1.8–2.2 mm diam.; phyllaries mostly 12–14, sparsely eobwebby, glabrescent, with apex erect; stercomes (in dried specimens), relatively thin, ±flat, green or partially purple, minutely blaek at tip, sometimes purple in a zone c. 1 mm long immediately below tip; post-fruetescence receptacle 3 mm diam., with phyllaries commonly finally somewhat reflexed. *Florets* 30–50, c. 80% female; eorolla-lobes triangular, hardly thickened apically; eorolla of bisexual florets 4.5–6 mm long, 4-lobed; eorolla-lobes of female florets 3 or 4, 0.1–0.2 mm long. *Achenes* lageniform, outer ones often rather eurved, 2.5–3.5 mm long, brown, with papillose hairs seattered in lines, l:w ratio of hairs e. 1–2. *Pappus* 5–6 mm long. (Figs 4g, 28)

Flowers spring–autumn.

Distribution and Habitat: Oecurs in south-eastern Australia: in south-eastern New South Wales and the Australian Capital Territory between Crookwell and Canberra; in eentral Victoria along the Murray River and south to the coast at Welshpool; and in north-eastern Tasmania near Cressy (Fig. 26b). Grows in loam to elay soils in forest and woodland, usually in seasonally inundated areas.

Notes: Similar to *S. quadridentatus* but differs by its sparsely haired to glabrous leaves and stems, broader leaves tapering distinctly to each end, broader phyllaries reflexed rather than spreading at maturity, shorter florets with more eorolla-lobes, eurved fruits, and the smaller taproot and fleshier seeondary roots. The receptaele undergoes relatively little expansion as the aehenes develop and, because of this, the capitula become slightly more urceolate than those of other speeies.

Selected specimens examined: **VICTORIA:** Macleys Plain, *A. Cunningham 61* (MEL); McAlister Travelling Stock Reserve, c. 6.5 km SE of Laggan on Goulburn Road; headwaters of Wollondilly River, *I. Crawford 5159*, 14.xii.1998 (CANB). **WESTERN AUSTRALIA:** Canberra, Beleonnen Naval Station, Ginninderra Creek, *I. Crawford 3271*, 27.x.1995 (CBG); Brooke's Creek, Federal Highway, *L.G. Adams 4194*, 12.xii.1999 (CANB). **VICTORIA:** Woori Yallock–Kooweerup Road c. 3 km south of Woori Yallock, *I.R. Thompson 704*, 14.xi.2001 (AD, BRI, CANB, MEL, NSW); Barmah Regional Park, *A.C. Beauglehole 82311*, 19.xi.1985 (AD, CANB, HO, MEL); Hepburn Regional Park, *A.C. Beauglehole 70601*, 8.v.1982 (MEL); Spadonis Reserve, to immediate west of junction of Olinda Creek and Yarra River, 2.5 km WNW of Yering, *D. Frood s.n.*, 23.x.1996 (MEL); Laverton, *W.R.A. Baker*, 20.v.1905 (MEL); Rail Reserve, Herne's Swamp, at end of aeeess road from N, *D.E. Albrecht 5274*, 6.vi.1993 (MEL); Campaspe River, west of Redesdale, *A.C. Beauglehole 70618*, 25.iv.1982 (AD, CANB, MEL). **TASMANIA:** Near Launeeston, *coll. unknown*, 21.iii.1888 (MEL); Swamp near Cressy, *J.H. Wilson*, Feb 1943 (HO).

19. *Senecio glabrescens* (DC.) Seh.Bip., *Flora oder Allgemeine Bot. Zeitung* 28: 498 (1845)

Erechtites glabrescens DC., *Prodr.* 6: 295 (1838); *E. quadridentata* var. *glabrescens* (DC.) Benth., *Fl. Austral.* 3: 660 (1867) *p.p.*

Type: [New South Wales], 'In Novae-Hollandiae, ad merid. Laeus Georgii lat 35° 50' [south of Lake George], *A. Cunningham*; holo: G (mierofiche seen MEL).

Herbs to 0.4 m high. *Taproot* well-developed; secondary roots c. 1 mm diam., hardly fleshy. *Stems* erect, nearly glabrous or sparsely appressed-cottony; stems multiple from

NATIONAL HERBARIUM OF VICTORIA (MEL)
MELBOURNE, AUSTRALIA
MEL 2173071
319 ASTERACEAE
Senecio glabrescens (DC.) Sch.Bip
Coll: Middleton, N.D. 163 Date: 04 Feb 2003
Addit. Coll: Marks, C.
AUSTRALIA : VICTORIA
Region/District: Grampians
Locality: Victoria Valley near Grampians National Park, Freshwater Lake Reserve, along Victoria Valley Road, approx. 10 km N of Dunkeld
Lat: 37°34 S Long: 142°20 E
Vic. Grid Ref: D 35
Notes: Growing in muddy area around receeding lake. Tussock-like habit.
Specimen dominant in ring around water line that would normally be covered in water during a wet period.
Det.: Thompson, J.R. 03 Jun 2003
Dupls: AD, BRI, CANB, HO, NSW, PERTH
NATIONAL HERBARIUM OF VICTORIA (MEL), AUSTRALIA

Figure 29. *Senecio glabrescens* (*N.D. Middleton 163 & C. Marks* MEL).

base and branching from lower axils in first season. *Leaves in middle third of primary stem* rather few, more or less evenly spaced and sized, very narrow-elliptic or linear, 8–12 cm long, l:w ratio c. 8–12, not dissected; base auriculate, with auricles bi- or tri-dentate, slightly amplexicaul; upper surface glabrous or minutely scabridulous on lowerstem leaves; lower surface green, sparsely to moderately cobwebby. *Uppermost leaves* narrow-lanceolate or linear, commonly widest at auricles. *Unit inflorescences* of many capitula; total number of capitula per stem often 50–200; overtopping marked; mature lateral peduncles mostly 10–20 mm long. *Capitula*: calycular bracteoles 3–6, 1.0–2.0 mm long; peduncle and margin of bracteoles cobwebby at anthesis; involucre 6.0–8.0 mm long, 1.8–2.2 mm diam.; phyllaries 12–14, cobwebby basally, with apex erect; stereomes (in dried specimens), ±flat, green, sometimes minutely black at tip, sometimes purple in a zone c. 1 mm long below tip; post-fruiteseence receptacle c. 3 mm diam., with phyllaries commonly finally spreading to reflexed. *Florets* 30–40, c. 80% female; corolla-lobes triangular, slightly thickened; corolla of bisexual florets 5–6 mm long, 4-lobed; corolla-lobes of female florets 3, c. 0.1 mm long. *Achenes* lageniform, 4.0–5.0 mm long, orange-brown or brown, with papillose hairs in lines, l:w ratio of hairs c. 1–2. *Pappus* 5–7 mm long. (Fig. 29)

Flowers summer–autumn.

Distribution and Habitat: Recorded from the Grampians in western Victoria, the Kiandra region in south-eastern New South Wales, and from South Ironcap in southern Western Australia (Fig. 26e). Recorded from margins of watercourses and lakes.

Notes: Differs from *S. quadridentatus* by having much sparser indumentum on stems and leaves, being branched from near the base, and having fewer and fleshier stem leaves with better developed auricles. *Senecio glandulosus* is similar in terms of indumentum characters but it is taller, is unbranched near the base, has fleshier secondary roots, and has more numerous, longer and basally attenuate leaves. It is very poorly collected, possibly overlooked, and the three known localities are very disjunct.

Selected specimens examined: **WESTERN AUSTRALIA:** 5 km south of South Ironcap, *K. Newbey 5219*, 8.vii.1979 (PERTH). **NEW SOUTH WALES:** Nungar Plain, Kosciuszko National Park, *I.R. Thompson 753 & N.G. Walsh* (MEL, CANB). **VICTORIA:** Victoria Valley near Grampians National Park, Freshwater Lake Reserve, along Victoria Valley Road, approx. 10 km north of Dunkeld, *N.D. Middleton 163 & C. Marks*, 9.ii.2003 (AD, BRI, CANB, HO, MEL, NSW, PERTH); Australia Felix, *coll. unknown* (MEL 22801).

20. *Senecio quadridentatus* Labill., *Nov. Holl. Pl.* 2: 48, t.194 (1806)

Erechtites quadridentata (Labill.) DC., *Prodr.* 6: 295 (1838).

Type: [Tasmania], 'Nova Hollandia in capite van Van-Dieman', *J.J.H. de Labillardiere*; iso: BM, K, *fide* R.O. Belcher *Ann. Missouri Bot. Gard.* 43: 58 (1956).

E. incana Turcz., *Bull. Soc. Imp. Naturalistes Moscou* 24(2): 85 (1851). Type: [Western Australia], Swan River, *J. Drummond 379*; iso: FI, K (photo seen MEL).

?*E. erecta* F.Muell. ex Lange, *Botanisk Tidsskrift* ser. 2, 4: 6 (in obs) (1874). Type: not known, *fide* R.O. Belcher, *loc. cit.* (1956).

Herbs to 1.2 m high. *Taproot* well-developed; secondary roots c. 1 mm diam., hardly fleshy. *Stems* erect, moderately to densely appressed-cottony, sometimes reducing nearer summit to moderately cottony, sometimes glabrescent and wool clumping before being lost; axillary growth commonly precociously developed; secondary and tertiary branching often well developed. *Leaves in middle third of stems* more or less evenly spaced and sized, linear to narrow-linear, 8–22 cm long, l:w ratio c. 15–40, (or 7–10 if lobes present), mostly not dissected, uncommonly coarse-dentate to lobate; segments remote, 1–3 per side largely in proximal half, spreading, triangular; base attenuate or occasionally with small, entire auricles, not amplexicaul; margin entire or with frequent

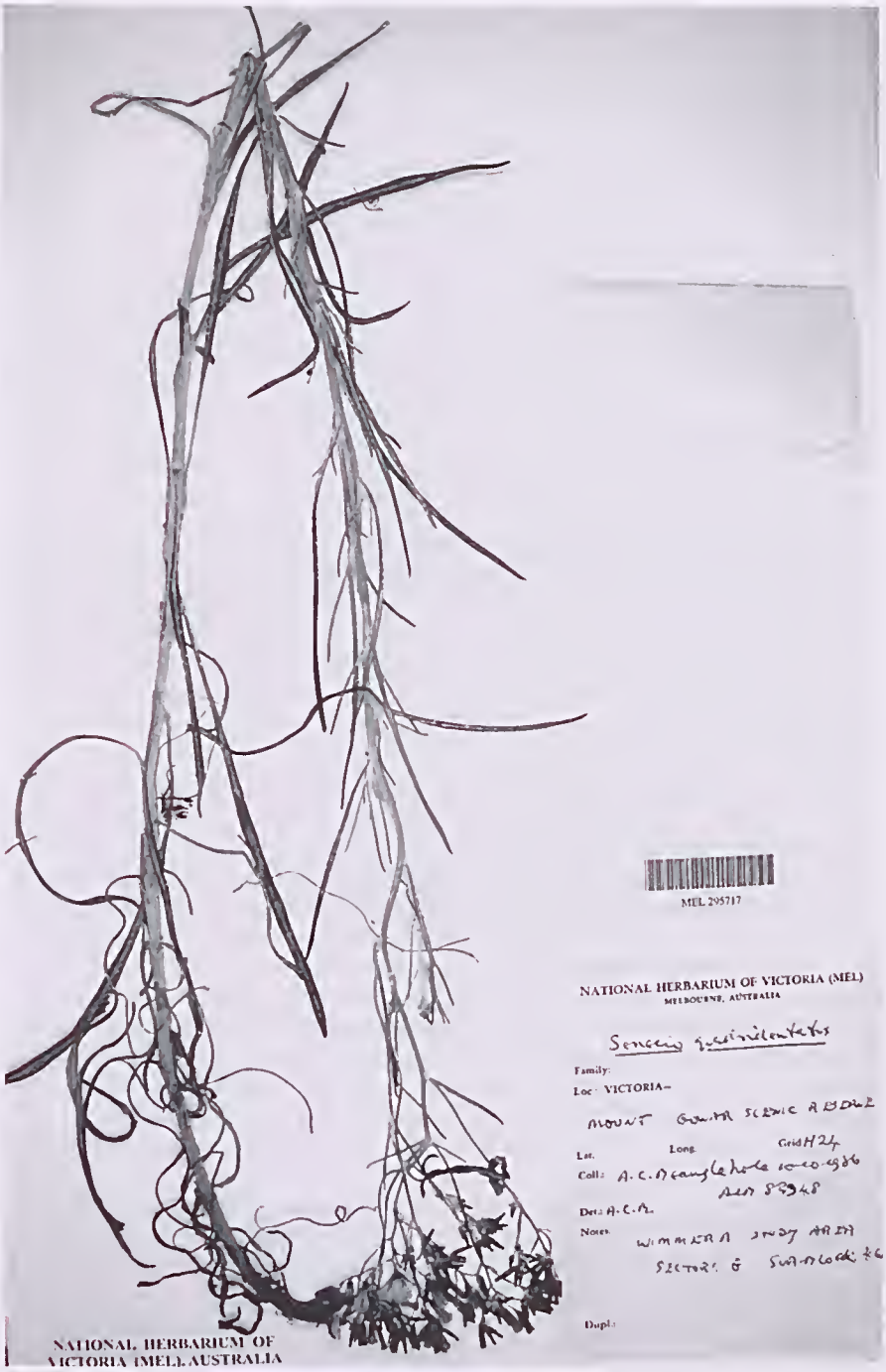

Figure 30. *Senecio quadridentatus* (*A.C. Beauglehole 85348* MEL).

minute denticulations, usually appearing entire due to revolute margin; upper surface appressed-cobwebby, soon or later glabrescent; lower surface green or rarely flushed purple, moderately to densely woolly. *Uppermost leaves* similar; auricles more commonly present, sometimes divided. *Unit inflorescences* usually of many capitula; total number of capitula per stem often 50–200; overtopping variable; mature lateral peduncles mostly 5–25 mm long. *Capitula*: calycular bracteoles 4–8, 1.0–3.0 mm long; peduncle and margin of bracteoles cobwebby to woolly at anthesis, rarely ±glabrous; involucre 6.0–10.0 mm long, c. 1.2–2.0 mm diam.; phyllaries (8–)11–14, cobwebby basally or ±glabrous, with apex erect; stereomes (in dried specimens) ±flat, green or partially purple, sometimes minutely black at tip, sometimes purple in a zone c. 1 mm long below tip; post-fruetescence receptacle 2–3 mm diam., with phyllaries commonly finally spreading. *Florets* 18–50, c. 80% female; corolla-lobes triangular, not or hardly thickened apically; corolla of bisexual florets 6–9 mm long, 4-lobed; corolla-lobes of female florets 3, c. 0.1 mm long. *Achenes* mostly lageniform, (1.6–)2.5–4.5(–5.0) mm long, rarely narrow-obloid and then very small, reddish or brown, sometimes green, with papillose hairs scattered in lines, l:w ratio of hairs c. 1–2. *Pappus* 6–8 mm long. (Fig. 30)

Flowers mostly spring–summer, commonly at other times.

Distribution and Habitat: Occurs in south-eastern Australia: in far south-eastern Queensland south from Dalby; throughout New South Wales and Victoria; in south-eastern South Australia as far west as Streaky Bay; and in northern and eastern Tasmania including the eastern Bass Strait islands. Also occurs in southern Western Australia from Perup in the far south-west east to Caiguna and north-east to Laverton (Fig. 26d). Also native to New Zealand. Grows in a wide range of soil types, in cleared land, urban wasteland, grassland, shrubland, woodland and drier forests from sea level to montane altitudes.

Notes: A very widespread species that has adapted well to urban environments. It is usually easily recognised by its grey aspect caused by its woolly or cottony indumentum on stems and on both or the lower surface of leaves. Coarse hairs are absent or only present on the lowermost leaves (these withered at anthesis) and then sparse and inconspicuous. Leaves are typically numerous along stems and are relatively crowded, and the precocious leafy axillary growth is usually evident in axils above mid stem as the initial flowering period commences.

Senecio quadridentatus has historically encompassed a much broader range of forms. The recognition of *S. quadridentatus*-like entities with coarse hairs as *S. temuiflorus* (in this paper split into several species) in recent years reduced the complex somewhat. In this treatment a degree of splitting of the remaining entities that lack coarse hairs has been achieved, but *S. quadridentatus sensu stricto* (i.e. as circumscribed herein) still exhibits considerable variation. This variation mostly involves capitulum size and achenial shape and size.

Populations on the Fleurieu Peninsula around and south of Adelaide in South Australia commonly have achenes that are not or hardly lageniform and only 1.6–2.2 mm long and inflorescences are more congested than usual. Some Victorian collections are similar. At the other extreme, some populations in north-western New South Wales have lageniform achenes 5 mm long. Several collections from Tasmania have involucres predominantly of 8–10 phyllaries and florets per capitula of c. 18–20. Old records from Rockhampton in south-eastern Queensland are unusually sparsely indumented but in other respects are typical.

A specimen collected by Charsley in 1886 from Silverton in far western New South Wales appears to be allied to *S. quadridentatus* but phyllaries are 16–20. It differs from *S. squarrosus* in the length of bracteoles, thickness of stereomes (in dried specimens) of phyllaries, and shape of basal auricles. Further collections are needed to adequately characterise this entity.

Hybrids with *S. dolichocephalus* have been recorded at Hambidge Reserve on the Eyre Peninsula of South Australia, and hybrids with *S. runcinifolius* have been recorded from the Murray River near Mildura.

Selected specimens examined: **WESTERN AUSTRALIA:** Bokerup Nature Reserve, *G.J. Keighery & N. Gibson 2485*, 21.x.1997 (CANB, PERTH). **SOUTH AUSTRALIA:** Mt Lofty Range. Spring Mount, ca. 8 km south-east of Adelaide, *D.J.E. Whibley 1709* (AD); Mt Crawford Forest Res., Kersbrook Forest, *H.P. Vonow 102* (AD, HO, MEL). **QUEENSLAND:** 2.2 km east of Allora along Forest Plain Road, *A.R. Bean 10851*, 4.x.1996 (BRI). **NEW SOUTH WALES:** Dead Horse Gully, Sturt National Park, *B. Wiecek 350, R.G. Coveny & M. Savio*, 6.ix.1989 (MEL, NSW, PERTH); Smiggin's Holes to Sawpit Ck., Kosciusko area, *M. Gray 6081* (AD, BRI, CANB, HO, MEL, NSW). **VICTORIA:** Dergholm State Park, c. 2 km east of Baileys Rocks, *I.C. Clarke 2559*, 25.x.1995 (AD, CANB, MEL); Fraser National Park, on western side of Eildon Reservoir, *T.B. Muir 3588*, 29.x.1964 (MEL). **TASMANIA:** Huon Road, near Hobart, *W.M. Curtis*, 5.ii.1952 (HO, MEL); St. Helens, *T.E. Burns 200*, 24.xii.1959 (HO).

21. *Senecio dolichocephalus* I.Thomps., *sp. nov.*

A *S. quadridentato* Labill. indumento caulis sparsiore, caulibus multo foliosioribus prope basin, foliis inferiore pilis grossis instructi, inferne purpureis, pedunculis et bracteolis glabris, capitulis plerumque longioribus differt; a *S. phelleo* I.Thomps. radice principali majore, capitulis longioribus, limbo corollae tenuiore, acheniis longioribus modice attenuatis apicem versus differt.

Type: Victoria, Wyperfeld National Park, Wonga Lake, ±7.5 km NNW of Wonga Hut, WNW side of Lake, *A.C. Beauglehole 55288*, 7 Nov. 1976; holo: MEL.

Herbs to 0.6 m high. *Taproot* moderately developed; secondary stems fleshy, to c. 1.5 mm diam. *Stems* erect, often woolly basally, appressed-cottony up to mid stem then sparsely cottony or ±glabrous above mid stem. *Leaves in middle third of stems* commonly becoming distinctly wider spaced and narrower upwards, oblanceolate to very narrow-elliptic, 3–12(–15) cm long, l:w ratio c. 4–15, not dissected, or less often coarse-dentate to lobate; segments 1–3 per side in middle third, spreading, triangular; base attenuate; margin with scattered denticulations or teeth; upper surface commonly scabridulous, sometimes transiently sparsely cobwebby also, becoming glabrous upwards; lower surface usually purple, coarse-hairy, often with a weak cobwebby overlay. *Uppermost leaves* narrow-linear, l:w ratio c. 15–30, usually not dissected; upper surface ±glabrous, cobwebby, sometimes very sparsely coarse-hairy; lower surface cobwebby; base sometimes with small, entire auricles. *Unit inflorescences* of several to many capitula; total number of capitula per stem often 20–60; overtopping marked; mature lateral peduncles mostly 8–25 mm long. *Capitula*: calycular bracteoles 4–8, 1.0–3.0 mm long; peduncle and margin of bracteoles glabrous or nearly so at anthesis; involucre 8.5–12.0 mm long, 1.5–2.0 mm diam.; phyllaries 12–14, glabrous, with apex erect; stereomes (in dried specimens) ±flat, green or partially purple, minutely black at tip, sometimes purple in a zone c. 1 mm long immediately below tip; post-fructescence receptacle 3 mm diam., with phyllaries commonly finally spreading. *Florets* 40–60, c. 80% female; corolla-lobes triangular-oblong, hardly thickened apically; corolla of bisexual florets 8–10 mm long, 4- or 5-lobed; corolla-lobes of female florets mostly 3, c. 0.1 mm long. *Achenes* weakly lageniform, 3.0–4.0 mm long, reddish or brown, sometimes green, with papillose hairs in lines, l:w ratio of hairs c. 1–2. *Pappus* 7–9 mm long. (Figs 3j, 31)

Flowers spring–summer.

Distribution and Habitat: Occurs in south-eastern Australia from the Eyre Peninsula in south-central South Australia east to Wycheproof in north-western Victoria. Also disjunctly recorded from Ravensthorpe and Balladonia in southern Western Australia (Fig. 26e). Grows in sandy soils in woodlands and shrublands.

Figure 31. *Senecio dolichocephalus* (holotype: *A.C. Beauglehole 55288* MEL).

Etymology: The epithet alludes to the relatively long capitula (Gk: *dolichos*, long, and *cephale*, head).

Notes: Senecio dolichocephalus is somewhat intermediate in morphology between *S. quadridentatus* and *S. phelleus*. The capitula are much longer than in S. phelleus and at the higher end of the range for *S. quadridentatus*. As in *S. phelleus*, the leaves of *S. dolichocephalus* tend to be broader and relatively crowded basally. *Senecio queenslandicus* has a similar habit but its capitula are shorter, phyllaries are thinner (at least on drying), and achenes are more strongly tapered to form a slender neck.

Selected specimens examined: **WESTERN AUSTRALIA:** 10 km ESE of Ravensthorpe, *K. Newbey 5124*, 18.ix.1978 (PERTH); 18 mi. [30 km] west of Balladonia, Eyre Highway, *B.L. Turner 5252*, 12.viii.1965 (MEL); Kalgoorlie, *J.H. Maiden*, Sept. 1909 (NSW, PERTH). **SOUTH AUSTRALIA:** The Pines Reserve (District Council of Kapunda), near NW corner, c. 7 km NW Kapunda, *P.J. Lang 2171*, 30.ix.1993 (AD); Murray Region, ca. 3 km west of Tepko, *K. Czornij 230*, 3.x.1968 (AD); Eastern. Hundred of Parnaroo, some 20 km east of Ueolta, *C.R. Alcock 10602*, 15.ix.1986 (AD, NE); Eyre Peninsula, Carrappee Hill about and above campsite, *D.E. Symon 8831*, 14.ix.1974 (AD); 2 km west of Keyneton P.O. Section 503, Hd of Jellicoe, *D. Cooke 452*, 3.x.1984 (AD); Mt. Lofty Range. Adelaide foothills, ridge above Brown Hill Creek, *Hj. Eichler 17051*, 16.x.1960 (AD, MEL); 11/2 m [2.5 km] north Winulta P.O., *D.E. Symon s.n.*, 14.ix.1961 (AD); Hambidge Reserve NW corner on flats, *D.E. Symon 4240*, 9.x.1966 (AD); Eyre Peninsula, Paney Station, *South Australia NPWS*, 9.x.1985 (AD); Mt Remarkable National Park, 11.7 km [from] Melrose at 271 degrees, *L.D. Williams 12593*, 20.ix.1982 (AD). **VICTORIA:** Murrawong North Roadside Reserve, *A.C. Beauglehole 83942*, 8.ix.1986 (MEL); Glenlee Flora and Fauna Reserve, *A.C. Beauglehole 84322*, 13.ix.1986 (MEL); Eastern Little Desert National Park, Kiata Lowan Sanctuary, *A.C. Beauglehole 84465*, 15.ix.1986 (MEL); Wyperfeld National Park, Wonga Lake, ±7.5 km NNW of Wonga Hut, WNW side of Lake, *A.C. Beauglehole 55288*, 7.xi.1976 (MEL); Wail State Forest, *A.C. Beauglehole 86070*, 15.x.1986 (MEL); Mallee, *F.M. Reader*, 16.ix.1898 (MEL); Little Desert. Near Broughton's Waterhole, 23 km SSE of Kaniva PO, *A.C. Beauglehole 66326*, 8.xi.1979 (MEL).

22. *Senecio queenslandicus* I.Thomps., *sp. nov.*

A *S. quadridentato* Labill. indumento lanato multo sparsiore, indumento foliorum pilis grossis instructo, foliis caulis paucioribus, capitulis plerumque brevioribus, flosculis numerosioribus differt.

Type: Queensland, 5 km SE of The Gums, *R.W. Johnson 553*, 2 Sept. 1958; holo: BRI; iso: NSW.

Herbs to 0.4 m high. *Taproot* well-developed; secondary roots 0.5–1 mm diam. *Stems* erect or briefly ascending to erect; sparsely to moderately cottony, sometimes becoming ±glabrous nearer summit; commonly multiple stems developing in first season. *Leaves in middle third of stems* rather few, more or less evenly spaced and sized, very narrow-elliptic, narrow-oblanceolate or ±linear, 5–10 cm long, l:w ratio c. 6–15, not dissected, or occasionally coarse-dentate to lobate; segments 1–3 per side in middle third, spreading, triangular; base attenuate; margin with scattered denticulations or teeth; both surfaces usually sparsely scabridulous becoming cobwebby or nearly glabrous upwards. *Uppermost leaves* linear to narrow-linear, l:w ratio c. 10–40; auricles sometimes developed, small, entire, hardly amplexicaul; surfaces sparsely coarse-hairy or cobwebby or ±glabrous. *Unit inflorescences* of several to many capitula; total number of capitula per stem typically 10–50; overtopping marked; mature lateral peduncles mostly 8–20 mm long. *Capitula*: calycular bracteoles 4–6, 1.0–3.0 mm long; peduncle and bracteole margin ±glabrous at anthesis; involucre 6.0–8.0 mm long, 2.0–2.5 mm diam.; phyllaries 12–14(–18), glabrous, with apex erect; stereomes (in dried specimens) rather thin, ±flat, green, commonly minutely black at tip, sometimes purple in a zone c. 1 mm long below tip; post-fructescence receptacle 3–3.5 mm diam., with phyllaries commonly finally spreading. *Florets* 50–80, c. 80% female;

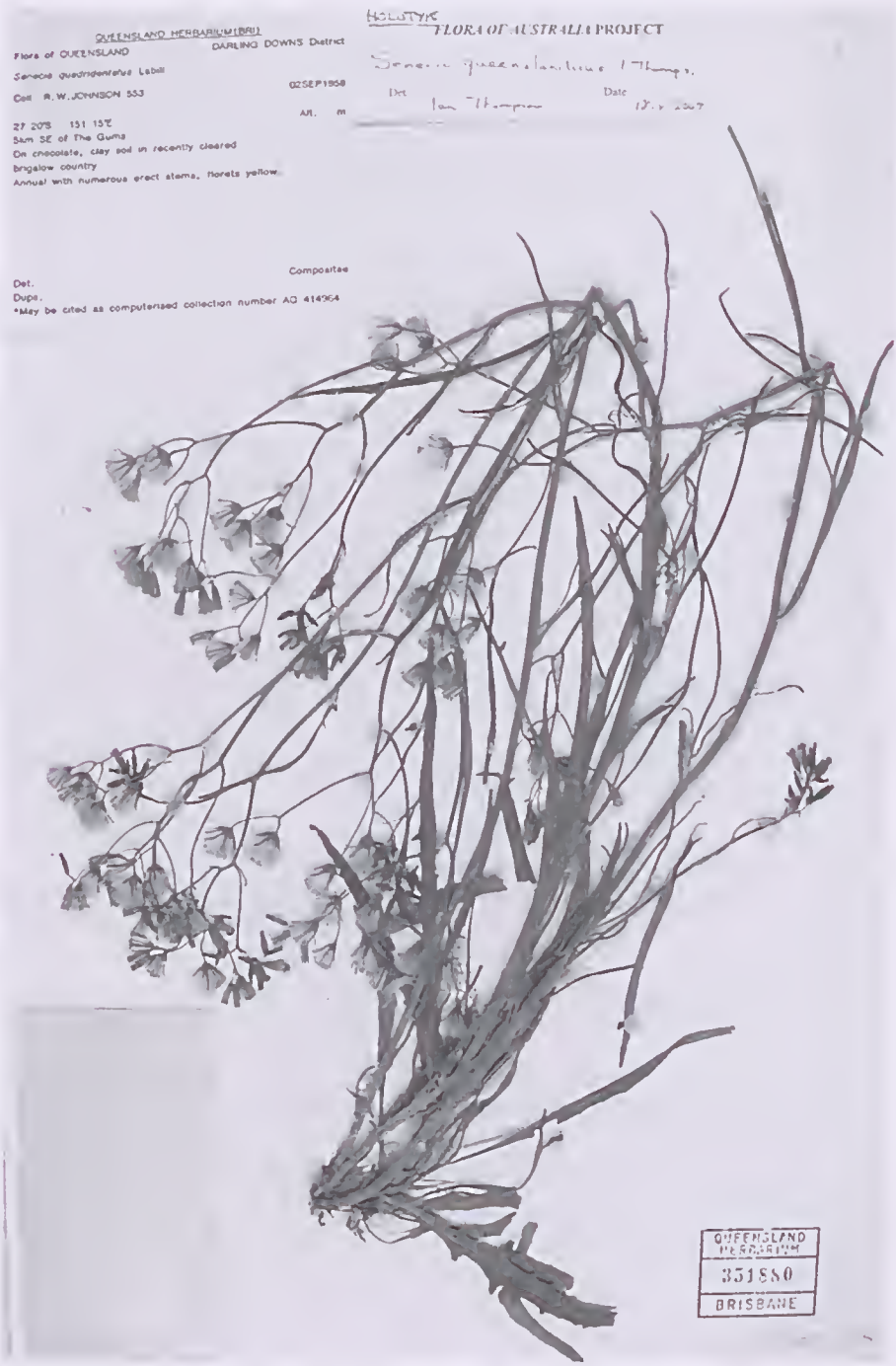

Figure 32. *Senecio queenslandicus* (holotype: *R.W. Johnson 553* BRI).

corolla-lobes triangular, not or hardly thickened apically; corolla of bisexual florets 5.5–7 mm long, 4-lobed; corolla-lobes of female florets 3, c. 0.1 mm long. *Achenes* lageniform, 2.5–4.0 mm long, neck relatively slender, reddish, brown or green, with papillose hairs scattered in lines, l:w ratio of hairs c. 1–2. *Pappus* 5.5–6.5 mm long. (Fig. 32)

Flowers most of year, more so in spring–summer.

Distribution and Habitat: Occurs in south-eastern Queensland from Blackall east-south-east to Moggill, and in north-central New South Wales from Weemelah to Moree and disjunctly further south-east near Muswellbrook (Fig. 26f). Grows in a wide range of soil types, in cleared land, grassland, shrubland, woodland at low altitudes in semiarid climates.

Etymology: The epithet alludes to the fact that this species predominantly occurs in Queensland.

Notes: *Senecio queenslandicus* differs from *S. quadridentatus* by having a shorter stature, fewer stem leaves, lack of precocious axillary growth, sparser stem and leaf indumentum and ±glabrous peduncles and capitula at anthesis, and inner phyllaries that are broader and more often with two resin channels. It differs from *S. dolichocephalus* by having shorter capitula with broader phyllaries and more numerous florets, and achenes tapering more distinctly to a slender neck. It appears to typically grow as an annual.

Selected specimens examined: **QUEENSLAND:** Inglewood-Texas road, 600 m north of Brush Creek, *A.R. Bean 6553*, 21.ix.1993 (BRI); "Iolanthe", c. 26 km SW of Garah, *K.L. Wilson 1919*, 28.ix.1978 (BRI, NSW); c. 4 miles [7 km] east of Meandarra in melon hole country, *M.J. Russell*, 1.viii.1969 (BRI); 80 km SSW of Blackall, *L. Pedley 5474*, 23.viii.1989 (AD, BRI); Moonie Highway, 45 miles [70 km] SW of Dalby, *S.L. Everist 6217*, 3.ix.1960 (BRI); The Oaks 22 m [36 km] west of Tara, *S.L. Everist 2675*, 17.viii.1946 (BRI); "Tamanick", 80 km SE of Mitchell, *C.M. Warrian CMW388*, 30.xi.1990 (BRI); Aurifer Downs NW of Toobeah, *Swarbrick 5200*, 7.ix.1970 (BRI); Langlo Crossing, 71.6 km WNW of Charleville on road to Adavale, *B.J. Lepschi & A.V. Slee 1116*, 12.x.1993 (BRI, CANB, MEL). **NEW SOUTH WALES:** "Iolanthe", c. 26 km SW of Garah, *K.L. Wilson 1919* 28.ix.1978 (AD, BRI, NSW); Gingham's Channel near Weemelah, *E.J. McBarron 15769*, 19.ix.1968 (NSW); Burning Mountain NR [Nature Reserve] between Muswellbrook–Murrurundi, *M. Roser, J.J. Bruhl & I.R. Telford*, 10862, 3.x.1998 (NE).

23. *Senecio phelleus* I.Thomps., *sp. nov.*

A *S. tenuifloro* (DC.) Sieber ex Seh.Bip. radice principali minore, foliis sagittatis, phyllariis tenuioribus, papillis acheniorum pluribus, costis acheniorum planis differt; a *S. prenanthoides* A.Rich. caulibus appresso-byssaceis, foliis saepe auriculatibus, capitulis latioribus pro ratione, acheniis non lageniformibus differt.

Type: Victoria, "The Common", east of Armstrong, ±9 km NNE of Ararat P.O., *A.C. Beauglehole 61220 & Field Naturalists Club of Ballarat 307*, 1 Nov. 1978; holo: MEL.

Herbs to 1.5 m high. *Taproot* reduced, obscure; secondary roots fleshy, 1–1.5 mm diam. *Stems* erect, sparsely to moderately appressed-cottony, gradually reducing in density upwards, sparsely cottony or ±glabrous in upper stem region. *Leaves in middle third of stems* becoming distinctly wider spaced and narrower upwards, oblanceolate, very narrow-elliptic or linear, 6–17 cm long, l:w ratio c. 6–12, not dissected or coarse-dentate to lobate; segments 1–3 per side in middle third, spreading, triangular; base attenuate or narrowly sagittate, not or slightly to moderately amplexicaul; margin with frequent denticulations or ±entire; upper surface coarse-hairy; lower surface commonly purple, coarse-hairy, usually with cobwebby overlay. *Uppermost leaves* linear to narrow-linear, l:w ratio c. 12–30; base as for middle stem leaves; surfaces with coarse hairs few or absent; lower surface usually somewhat cobwebby. *Unit inflorescences* of several to many capitula; total number of capitula per stem often 20–100; overtopping slight to

Figure 33. Distribution of a. *Senecio phelleus*; b. *S. microbasis*; c. *S. scabrellus*; d. *S. tenuiflorus*; e. *S. gunnii*; f. *S. niveoplanus*.

Figure 34. *Senecio phelleus* (holotype: *A.C. Beauglehole 61220* MEL).

moderate; mature lateral peduncles mostly 5–25 mm long. *Capitula*: calycular bracteoles 3–5, 1.0–2.0 mm long; peduncle and margin of bracteoles ±glabrous at anthesis; involucre 6.0–7.5 mm long, 1.5–2.0 mm diam.; phyllaries 12–14, glabrous, with apex erect; stereomes (in dried specimens) mostly gently convex, green, rarely tinged purple, minutely black at tip, sometimes purple in zone c. 1 mm long below tip; post-fructescence receptacle 2.5–3 mm diam., with phyllaries commonly finally erect. *Florets* 30–45, c. 80% female; corolla-lobes triangular, thickened apically; corolla of bisexual florets 6–7 mm long, mostly 5-lobed; corolla-lobes of female florets 4, 0.3 mm long. *Achenes* narrow-obloid to narrow oblong-ellipsoid, 2.0–2.5(–3.0) mm long, orange-brown, with papillose hairs scattered or dense in bands, l:w ratio of hairs c. 2–3. *Pappus* 6–7.5 mm long. (Figs 1b, 2a, 4b, 34)

Flowers mostly spring–autumn.

Distribution and Habitat: Occurs in south-eastern Australia, from Bathurst in central-eastern New South Wales south to eastern Victoria then west to Adelaide in south-eastern South Australia, disjunctly further west on the Eyre Peninsula, and near Hobart in south-eastern Tasmania (Fig. 33a). Grows in sandy or heavy soils, often in rocky sites in heathland, and in, usually, drier forest and woodland.

Etymology: The epithet alludes to the stony, often skeletal soils where this species commonly occurs (Gk: *phelleus*, stony ground).

Notes: A common species in eastern South Australia and Victoria. In the past it has been identified as *S. quadridentatus* and more recently as *S. tenuiflorus*. See under *S. microbasis*, *S. tenuiflorus* and *S. prenanthoides* for differences between it and these similar species.

A specimen of this species (Fiedler's section in South Australia, Behr, MEL), was cited by Sonder as corresponding to the type of *Senecio apargiifolius* Walp., when he recombined this species as *Erechtites apargiifolius* (Walp.) Sond. Although Sonder stated that the specimen agreed with the type, Walper's description of *S. apargiifolius* stated that all florets are bisexual, and his description disagrees in several other respects from Behr's specimen. Whether Walpers' type does actually correspond to Behr's can not be verified as it cannot be located (see Belcher 1956). Thus the name *S. apargiifolius* could not be applied to the taxon described above.

Senecio phelleus is similar to *S. quadridentatus* but with a smaller taproot, sagittate leaf-bases, shorter capitula, glabrous peduncles and capitula, corollas of bisexual florets 5-lobed, with lobes more thickened, and achenes not lageniform. It is also similar to *S. prenanthoides*, which has in recent years been included with this species under *S. tenuiflorus*, in habit, indumentum of leaves, and bracteole number, but differing by having the lower stem region with an appressed-cobwebby indumentum, more florets per capitulum; secondary roots not subtuberous, leaf-bases commonly sagittate, and achenes shorter and not narrowly lageniform. It is also similar to *S. microbasis* but differs by its lower leaves being broader, capitula larger and with more florets, leaf-bases sagittate, and neck of achenes less slender.

Selected specimens examined: **SOUTH AUSTRALIA:** Southern Lofty. Telephone Road Mt Crawford, *R.J. Bates 35559*, 23.xii.1993 (AD, MEL). **NEW SOUTH WALES:** Travelling Stock Reserve 39, western paddock, c. 600m in from Snowy Mountains Highway. Turnoff c. 2 km past Cooma Caravan Park, *J. Miles s.n.*, 15.xii.1998 (CANB). **AUSTRALIAN CAPITAL TERRITORY:** Lower east slopes of Black Mtn, Canberra, *R. Pullen 2370*, 20.xi.1960 (CANB, MEL, NSW). **VICTORIA:** Hard Hills Flora reserve, 6 km NE of St Arnaud PO, *A.C. Beauglehole 65531*, 25.x.1979 (AD, MEL); 2.5 km north of Tallarook, on east side of Hume Highway, *T.B. Muir 6194*, 12.x.1978 (MEL); Woodland south west of 'Jindalee', Greta West, *J.R.Hosking 664*, 30.xii.1992 (CBG, MEL, NE). **TASMANIA:** Betsey Island, *K. Harris s.n.*, 15.x.1983 (HO).

24. *Senecio microbasis* I.Thomps., *sp. nov.*

A *S. tenuifloro* (DC.) Sieber ex Sch.Bip. foliis non lobatibus, costis aeheniorum planioribus papillis sparsioribus differt.

Type: Victoria, Splitters Range, c. 15 km direct east of Omeo, Mt Shaw Road 3.3 km east of intersection with Spring Hill Track, *I.R. Thompson 726*, 4 Dec. 2001; holo: MEL; iso: BRI, CANB, HO, NSW.

Herbs to 0.6 m high. *Taproot* usually moderately developed; secondary roots hardly fleshy, 0.5–0.8 mm diam. *Stems* erect, ±glabrous or sparsely appressed-cottony basally. *Leaves in middle third of stems* often becoming distinctly wider spaced and narrower upwards, narrow-oblanceolate to linear, 4–10 cm long, l:w ratio c. 8–15, not dissected; base attenuate; margin ±entire or with scattered denticulations or teeth; surfaces scabridulous; lower surface purple. *Uppermost leaves* narrow-linear, l:w ratio c. 15–40; base sometimes with very small, entire auricles, not amplexicaul; surfaces sparsely coarse-hairy or glabrous. *Unit inflorescences* of several to many capitula; total number of capitula per stem often 20–60; overtopping often marked; mature lateral peduncles mostly 8–20 mm long. *Capitula*: calycular bracteoles 3–5, 1.0–2.0 mm long; pedunele and margin of bracteoles ±glabrous at anthesis; involucre 5.0–7.0 mm long, 1.0–1.4 mm diam.; phyllaries 7–13, glabrous, with apex erect; stereomes (in dried specimens) flat or gently convex, green or rarely tinged purple, minutely black at tip; post-fructescence receptacle 1.5 mm diam., with phyllaries commonly finally reflexed. *Florets* 12–25, c. 80% female; corolla-lobes triangular, not or slightly thickened apically; corolla of bisexual florets 5–6 mm long, mostly 4-lobed; corolla-lobes of female florets 3, c. 0.2 mm long. *Achenes* narrow oblong-ellipsoid or slightly lageniform, 2.0–2.8 mm long, red-brown or dark brown, with papillose hair, in lines, l:w ratio of hairs c. 2. *Pappus* 4.5–6 mm long. (Fig. 35)

Flowers spring–summer.

Distribution and Habitat: Occurs predominantly in south-eastern Australia from Mt Kaputar in north-central New South Wales south to near Omeo in eastern Victoria, and in eastern Tasmania (Fig. 33b). There is a single record from Kambalda in southern Western Australia which is probably an introduction. Grows in drier forest and woodland.

Etymology: The epithet alludes to the small receptacle (Gk: *micro*, small, and *basis*, base).

Notes: This species is similar to *S. phelleus* but with narrower leaves near the base of the plant, leaf-bases never sagittately auriculate, capitula narrower and with fewer florets, phyllaries thinner and finally reflexed, corolla-lobes fewer and less thickened apically, and the achenes with a more slender neck. Similar to *S. tenuiflorus* but the leaves are never lobed, auricles if ever developed are much smaller, and the achenes have flatter ribs and more numerous papillose hairs. Similar to *S. pterophoroides* but the lower stem lacks coarse hairs and the achenes are shorter and not as distinctly lageniform.

Selected specimens examined: **WESTERN AUSTRALIA**: 14.1 km from Higginsville Pump Station on a bearing of 179 degrees, south of Kambalda, *A.A. Mitchell 5049*, 8.xii.1997 (PERTH). **NEW SOUTH WALES:** Major's Creek to Araluen scarp, *M. Gray 6074*, 18.xii.1967 (AD, MEL, NSW); south of Woodsreef mine, *J.R. Hosking 1319*, 15.x.1996 (CANB, MEL, NE, NSW). **VICTORIA:** 10.3 km SSW of Mt Tambo, 5 m NW of Mt Shaw Rd, 3.3 km east of Spring Hill Tk, *G.W. Carr 10233*, 8.xii.1984 (AD, MEL); East Gippsland, Mt Menaak, Suggan Buggan, *A.C. Beauglehole 36671 & E.W. Finck*, 2.ii.1971 (MEL); East Gippsland, Boundary Creek, Gelantipy, *N.A. Wakefield 2776*, 10.i.1949 (MEL); Tambo River Reference Area, *A.C. Beauglehole 77127*, 18.ix.1984 (CANB, MEL). **TASMANIA**: Near Conara, *A.C. Rozefelds 909*, 22.x.1998 (HO); Weedons Hill area, north of Fox's gully, Elderslie area, *F. Duncan 1026*, 30.iv.1985 (HO).

HOLO-
TYPE
NATIONAL HERBARIUM OF VICTORIA (MEL), AUSTRALIA
NATIONAL HERBARIUM OF VICTORIA (MEL)
MELBOURNE, AUSTRALIA
MEL 2173072
349 ASTERACEAE
Senecio microbasis I Thomps
HOLOTYPE
Coll: Thompson, I.R. 726 Date: 04 Dec 2001
AUSTRALIA: VICTORIA
Region/District: Snowfields
Locality: Splitters Range, c. 15 km direct E of Omeo, Mt Skew Road 3.2 km E of intersection with Spring Hill Track.
Lat.: 37°06'S Long.: 147°46'E
Alt.: 720 m Vic. Grid Ref.: W 5
Notes: Open forest. Soils skeletal. Growing with Senecio quadridentatus.
Small erect plants
Det: Thompson, I.R. 31 May 2002
Dupls: BRI, CANB, HO, NSW

Figure 35. *Senecio microbasis* (holotype: *I.R. Thompson 726* MEL).

25. *Senecio scabrellus* I.Thomps., *sp. nov.*

A *S. tenuifloro* (DC.) Sieber ex Sch.Bip., pilis grossis foliorum pluribus, foliis superis et peduncnlis lanatioribus, achcniis tenuioribus papillis multioribus differt.

Type: Queensland, Mt Mitchell, Cunningham's Gap, *P.I. Forster PIF11098 & R. Reilly*, 18 Aug. 1992; holo: BRI; iso: K, MEL.

Herbs to 0.5 m high. *Primary roots* well-developed; secondary roots slightly fleshy, c. 1 mm diam. (only one example seen). *Stems* erect or sprawling, somewhat coarse-hairy mainly below mid stem, glabrescent, becoming sparsely to moderately appressed-cottony or woolly in upper stem region; secondary and tertiary branching often well-developed. *Leaves in middle third of stems* more or less evenly spaced and sized, narrow-elliptic to linear, 5–10 cm long, l:w ratio c. 6–15, not dissected or occasionally coarse-dentate; segments 2 or 3 per side in middle third, spreading, triangular; base auriculate, with auricles sometimes dentate; margin usually with frequent denticulations; upper surface densely scabrid, sometimes a little obscured by cottony hairs; lower surface densely woolly, the woolly indumentum obscuring coarse hair-bases. *Uppermost leaves* similar in shape, l:w ratio c. 10–20; margin often appearing entire due to rolling. *Unit inflorescences* of several to many capitula; total number of capitula per stem often 20–60; overtopping not ascertained; mature lateral peduncles mostly 7–15 mm long. *Capitula*: calycular bracteoles 3–5, 1.0–1.5 mm long; peduncle and margin of bracteoles patchily woolly or cobwebby at anthesis; involucre 5.0–7.0 mm long, 1.0–1.5 mm diam.; phyllaries mostly 7–10, glabrous, with apex erect; stereomes (in dried specimens) ±flat, green, commonly minutely black at tip; post-fructescence receptacle 1.5 mm diam., with phyllaries finally variously oriented. *Florets* 12–25, c. 70% female; corolla-lobes triangular, slightly thickened apically; corolla of bisexual florets 5–5.5 mm long, 4- or 5-lobed; corolla-lobes of female florets 3 or 4, 0.2–0.3 mm long. *Achenes* very narrow obloid to slightly lageniform, 2.8–3.2 mm long, ribs convex, light or dark brown or reddish, with papillose hairs scattered to crowded in lines, l:w ratio of hairs c. 2–3. *Pappus* 5–6 mm long. (Fig. 36)

Flowers mostly winter–spring.

Distribution and Habitat: Occurs over a small mountainous area of far south-eastern Queensland and far north-eastern New South Wales almost on the border between the two states and c. 100 km inland from the coast (Fig. 33e). Grows on rocky (rhyolite) cliff-lines and trachyte pavements in heathland or woodland on or near mountain summits

Etymology: The epithet alludes to the short, coarse hairs densely covering the upper surface of leaves (L: *scabrellus*, minutely roughened).

Notes: *Senecio scabrellus* is characterised by a much-branched habit, leaves both densely scabridulous and woolly, branches and peduncles woolly, capitula slender and few-floreted, and achenes relatively slender. Its closest relative is probably *S. tenuiflorus*, which has similarities in habit, indumentum type, and in having convex ribs on the achenes.

Selected specimens examined: **QUEENSLAND:** Mt Huntley, western slopes, *P.I. Forster PIF11832, D. Halford & R. Reilly*, 4.x.1992 (BRI); Mt Cordeaux, *R.W. Johnson 1159*, 9.x.1959 (BRI); Mt Lindesay, *P.I. Forster PIF12180*, 26.x.1992 (BRI). **NEW SOUTH WALES:** Mt Lindesay, 7 miles (11.2 km) ESE of Woodenbong, *R. Coveny 4558 & A.N. Rodd*, 9.ix.1972 (BRI, NSW).

26. *Senecio tenuiflorus* (DC.) Sieber ex Sch.Bip., *Flora* 28: 498 (1845)

Erechtites tenuiflora DC., *Prodr.* 6: 296 (1838).

Type: [New South Wales], 'In Nova-Hollandia', *Sieber 435*; lecto (here designated): MEL; isolecto: G (microfiche seen MEL).

Figure 36. *Senecio scabrellus* (holotype: *P.I. Forster 11098 & R. Reilly* BRI).

Herbs to 0.6 m high. *Taproot* well-developed; secondary roots hardly fleshy, 0.5–0.8 mm diam. *Stems* erect, ±glabrous or sparsely appressed-cottony; commonly becoming moderately branched. *Leaves in middle third of stems* sometimes becoming distinctly wider spaced and narrower upwards, narrow-oblanceolate, narrow-lanceolate, or linear, 7–15 cm long, l:w ratio c. 8–20, not dissected or remotely lobate to deeply lobate; segments 1–3 per side mostly in proximal half, spreading, triangular to narrow-triangular; base attenuate or auriculate, with auricles narrow-triangular to 5 mm long, not amplexicaul; margin nearly entire or with scattered denticulations or sometimes with a few teeth; both surfaces coarse-hairy; lower surface green or purple, usually hairs with a cobwebby overlay. *Uppermost leaves* l:w ratio c. 15–40 or much lower if lobes present; base auriculate, with auricles often rather long, entire, narrow-triangular, hardly amplexicaul; upper surface sparsely coarse-hairy or glabrous; lower surface sometimes moderately cobwebby or woolly, hairs not obviously coarse-based. *Unit inflorescences* of several to many capitula; total number of capitula per stem often 20–60; overtopping moderate; mature lateral peduncles mostly 6–22 mm long. *Capitula*: calycular bracteoles 2–6, 1.0–1.5 mm long; peduncle and margin of bracteoles glabrous or slightly cobwebby; involucre 5.0–7.0 mm long, 1.0–1.5 mm diam.; phyllaries 7–13, glabrous, with apex erect; stereomes (in dried specimens) rather thin, ±flat, green, sometimes minutely black at tip; post-fructescence receptacle 2–3 mm diam., with phyllaries commonly finally reflexed. *Florets* 15–35, c. 80% female; corolla-lobes triangular, hardly thickened apically; corolla of bisexual florets 5.5–7 mm long, 4- or 5-lobed; corolla-lobes of female florets 3 or 4, c. 0.2 mm long. *Achenes* narrow-oblong-ellipsoid to narrow-ellipsoid, often rather curved, 2.0–2.5 mm long, olive-brown, orange-brown or reddish, ribs convex, relatively crowded, glabrous or with papillose hairs sparse in recessed lines, l:w ratio of hairs c. 2–3. *Pappus* 5–6 mm long. (Figs 4, 37)

Flowers most of year.

Distribution and Habitat: Occurs in eastern Australia from Rockhampton in south-eastern Queensland south to the Sydney area in central-eastern New South Wales and extending inland in south-eastern Queensland as far as Mitchell (Fig. 33d). Grows in loams and sands, often on rocky slopes, in forest and woodland.

Notes: The name *S. tenuiflorus* was resurrected by Belcher through the application of determinavit slips, but without any supporting publication, in the 1980s. This name was largely applied to a suite of entities from eastern Australia previously referred to *S. quadridentatus* but with coarse hairs and with achenes not always lageniform. In this paper several entities that Belcher and others included under *S. tenuiflorus*, based on their determinations, are described as separate species. These are *S. preuanthoides*, *S. phelleus*, *S. dolichocephalus* and *S. microbasis*.

The achenial morphology of *Senecio tenuiflorus* is distinctive. Ribs are typically somewhat convex and closely spaced with short papillose hairs absent or sparse in intervening grooves, and the outer achenes of a capitulum are usually distinctly curved. The stereomes of the phyllaries are relatively thin and flat on drying like those of *S. queenslandicus* and *S. quadridentatus*. Apart from these characters, *S. tenuiflorus* differs from *S. phelleus* by the better developed taproot, the leaf-bases that have triangular lateral lobes rather than sagittate ones, and the less thickened apex of corolla-lobes. *Senecio preuanthoides* is also similar but it has a coarse-hairy lower stem region and lageniform achenes. *Senecio microbasis* has smaller leaves lacking narrow-triangular lobes and auricles, and its achenes are more densely papillose and less convexly ribbed.

Only the MEL duplicate of the type collection *Sieber 435* has been examined. De Candolle is likely to have examined the duplicate at G when describing *Erechtites tenuiflora* but, because there is a possibility that the G specimen is not the same as that at MEL, the latter is chosen here as the lectotype.

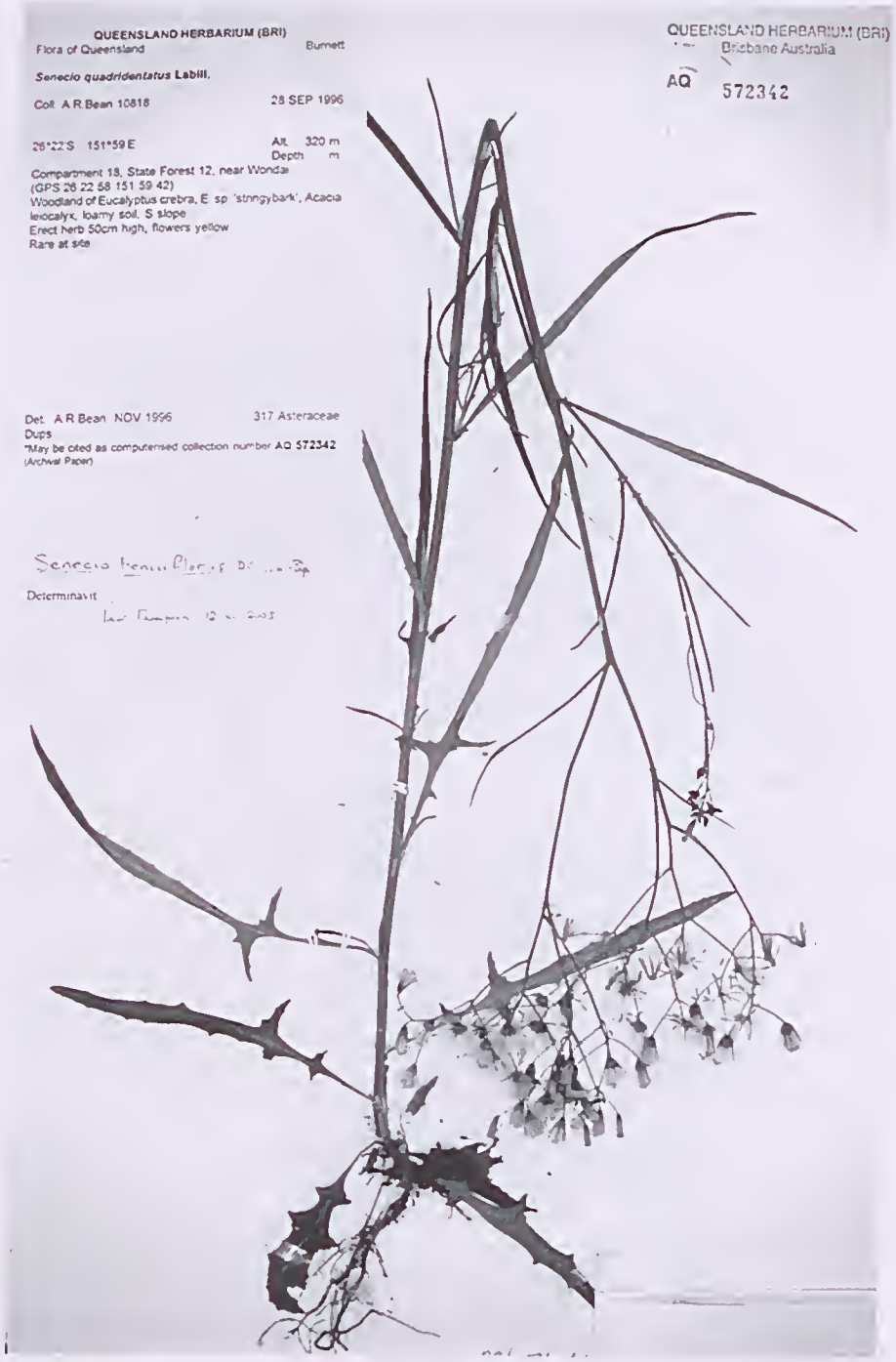

Figure 37. *Senecio tenuiflorus* (*A.R. Bean 10818* BRI).

Selected specimens examined: **QUEENSLAND:** Maryvale Rubbish Tip, NE of Warwick, *A.R. Bean 9514*, 6.i.1996 (BRI); Mt Glorious, *B.A. Lebler & L. Durrington*, 28.xi.1972 (BRI); Mount Toowoonan, 11 km WSW of Maroon, *D. Halford Q1511*, *P.I. Forster & R. Reilly*, 3.ix.1992 (BRI); Palmgrove National Park, NW of Taroom, Bigge Range, *P.I. Forster PIF23731 & R. Booth*, 4.xi.1998 (BRI); Helidon, Pickerings Gully, *L.H. Bird & P.I. Forster PIF2998*, 30.viii.1987 (BRI); Bunya Mountains, Big Falls area, *L.S. Smith*, 15.xii.1954 (BRI); Kenilworth Bluff, about 8 km north of Kenilworth, *P.R. Sharpe 4652 & T. Bean*, 7.iii.1987 (BRI); Blackdown Tableland, ca. 35 km SE of Blackwater, *R.J. Henderson 993*, *L. Durrington & P. Sharpe*, 4.ix.1971 (BRI, MEL); Gap Creek Road, east of Springsure, *A.R. Bean 14159*, 13.x.1998 (BRI); Beeron holding, 7 km west of "Toondahra", *P.I. Forster 7128*, 20.viii.1990 (BRI, MEL). **NEW SOUTH WALES:** North Western Slopes: North Western Slopes: Kwiambal National Park, c. 130 km NW of Glen Innes, junction of McIntyre and Severn Rivers, *J.T. Hunter s.n.*, Nov 1997 (NE); Attunga State Forest, *J.R. Hosking 210*, 25.x.1990 (NE, NSW); Copeland, c. 14 miles [23 km] NW of Gloucester, *R. Coveny s.n.*, 2.i.1967 (NSW); Rotherwood Road off Mt Hercules Road, Razorback range [10 km SSW of Camden], *R. Coveny 7468*, *D. Benson & H. Bryan*, 17.iii.1976 (NSW).

27. ***Senecio gunnii*** (Hook.f.) Belcher, *Ann. Missouri Bot. Gard.* 43: 64 (1956)

Erechtites gunnii Hook.f., *Hooker's London J. Bot.* 6: 122 (1847); *E. quadridentata* DC. var. *gunnii* (Hook.f.) Benth., *Fl. Austral.* 3: 660 (1867).

Type: [Tasmania], Marlboro, *R.C. Gunn 700/1842*, Jan. 1841; syn: K, NSW.

Herbs to 1 m high. *Taproot* sometimes well-developed; secondary roots fleshy, 0.8–1.5 mm diam. *Stems* erect, moderately appressed-cottony, sometimes sparser upwards, rarely nearly glabrous. *Leaves in middle third of stems* more or less evenly spaced and sized, oblanceolate, narrow-elliptic or very narrow-elliptic, 6–12 cm long, l:w ratio c. 3–7, not dissected or occasionally coarse-dentate to lobate; segments 4–6 per side mostly in middle third, spreading, triangular; base attenuate or cuneate; margin entire or with frequent denticulations or teeth; upper surface sparsely to densely appressed-cobwebby, glabrescent; lower surface often purple, moderately densely, or rarely sparsely, appressed-cobwebby. *Uppermost leaves* very narrow-elliptic, l:w ratio c. 5–9; base cuneate or with small entire, auricles. *Unit inflorescences* of several to many capitula; total number of capitula per stem often 10–100; overtopping slight; mature lateral peduncles mostly 6–15 mm long. *Capitula*: calycular bracteoles 3–6, 2.0–3.5 mm long; peduncle and margin of bracteoles cobwebby to woolly at anthesis; involucre 5.0–7.5 mm long, c. 1.7–2.0 mm diam.; phyllaries 11–14, cobwebby or glabrous, with apex erect; stereomes (in dried specimens) ±flat, green, minutely black at tip, sometimes purple in a zone c. 1 mm long immediately below tip; post-fructescence receptacle 2–4 mm diam., with phyllaries finally erect or spreading. *Florets* 26–40, c. 70% female; corolla-lobes triangular, slightly thickened apically; corolla of bisexual florets 6–7 mm long, 5-lobed; corolla-lobes of female florets 4 or 5, 0.2–0.3 mm long. *Achenes* very narrow oblong-ellipsoid, 2.5–4.0 mm long, olive-brown, usually with very few papillose hairs in lines, l:w ratio of hairs c. 2. *Pappus* 5–6 mm long. (Fig. 38)

Flowers summer–autumn.

Distribution and Habitat: Occurs in south-eastern Australia from the Brindabella Ranges in the Australian Capital Territory and far south-eastern New South Wales south-east to Lake Mountain in south-central Victoria, and from Mt Arthur in northern Tasmania south to Mt Wellington and south-west to Eldon Bluff (Fig. 33e). Grows in woodlands, grasslands, herbfields and open shrublands in montane to alpine areas.

Notes: *Senecio gunnii* resembles *S. quadridentatus* in terms of type and density of indumentum but it differs by having broader, narrow-elliptic leaves, more convex stereomes, bisexual florets with 5-lobed corollas, female florets with larger corolla lobes, and more sparsely haired and non-lageniform achenes. A specimen from Tinderry South

MEL 117062
ASTERACEAE OF AUSTRALIA
Senecio gunnii (Hook. f.) Belcher
DET P. S. Short, 1988
Victoria. Mount Buffalo National Park. Top of mountain at the Horn. Elevation 1580 metres.
Locally common, herbs 40 cm. tall, flowers yellow. Biochemical voucher
Robert Merrill King
9767
6 January 1989
NATIONAL HERBARIUM OF VICTORIA (MEL), AUSTRALIA
Collected by Robert M. King and Federico E. Heinz for the United States National Herbarium (US) Smithsonian, and The National Herbarium of Victoria (MEL).

Figure 38. *Senecio gunnii* (*R.M. King 9767* MEL).

Peak near Canberra (*J.H. Willis*, 12 Jan. 1970, MEL), is possibly a hybrid; vegetatively it resembles *S. gunnii*, but the capitula are atypical of this species in having fewer and longer phyllaries and fewer florets, and in these respects it more closely resembles *S. prenanthoides*.

Selected specimens examined: **NEW SOUTH WALES:** Kangaroo Range, ca 3 miles [5 km] from Mt Kosciusko [Kosciuszko] summit, *C. Totterdell 114*, 27.ii.1970 (CANB, MEL, NSW). **VICTORIA:** Blue Rag Range, c. 15 km SE of Mt Bernard on Hotham–Dargo road, *L. Haegi 1638*, 5.ii.1979 (MEL, NSW). **TASMANIA:** Ben Lomond National Park, Ski Village, *S.J. Forbes 1381*, 3.ii.1983 (CBG, HO, MEL).

28. *Senecio niveoplanus* I.Thomps., *sp. nov.*

A *S. gunnii* (Hook.f.) Belcher pilis grossis instructis, phyllariis et flosculis plerumque paucioribus, acheniis glabris differt; a *S. prenanthoides* A.Rich. foliis auriculatis, foliis summis lanceolatis, acheniis pallidis glabris non lageniformibus differt.

Type: Victoria, Alpine National Park, Northern end of Howitts Plain, c. 300 m west along Butcher Country Track from intersection with Howitt Plain Road, *I.R. Thompson 758*, 6 Feb. 2002; holo: MEL; iso: AD, CANB, HO, NSW.

Herbs to 1.2 m high. *Taproot* not known; secondary roots fleshy, c. 1 mm diam. *Stems* erect, coarse-hairy, density reducing upwards, glabrous or sparsely cottony near summit. *Leaves in middle third of stems* more or less evenly spaced and sized, narrow-elliptic or lanceolate, 7–16 cm long, l:w ratio c. 3–6, coarse-dentate to lobate; segments 3 or 4 per side in proximal half to two-thirds, spreading, triangular; base usually auriculate above mid stem, with auricles divided, not or slightly amplexicaul; margin usually with frequent denticulations and occasional teeth; both surfaces coarse-hairy; lower surface commonly purple, sometimes with a cobwebby overlay over coarse hairs. *Uppermost leaves* lanceolate, l:w ratio c. 5–7, dentate or lobate proximally, not widest at auricles. *Unit inflorescences* of many capitula; total number of capitula per stem often 30–100; overtopping variable; mature lateral peduncles mostly 7–15 mm long. *Capitula*: calycular bracteoles 3–4, 2.0–3.0 mm long; peduncle and margin of bracteoles sparsely cobwebby at anthesis; involucre 6.0–8.0 mm long, 1.5 mm diam.; phyllaries 8–13, glabrous, with apex erect; stereomes (in dried specimens) gently convex, green, sometimes minutely black at tip, sometimes purple in a zone c. 1 mm long below tip; post-fructescence receptacle unknown. *Florets* 15–25, c. 70% female; corolla-lobes triangular, hardly thickened apically; corolla of bisexual florets 6–7 mm long, 5-lobed; corolla-lobes of female florets 4, 0.3 mm long. *Achenes* narrow oblong-ellipsoid, 3.0–4.0 mm long, olive brown, glabrous. *Pappus* 6–7 mm long. (Figs 4f, 39)

Flowers late summer to autumn.

Distribution and Habitat: Occurs in eastern Victoria between Licola and Falls Creek, and in the Australian Capital Territory at Cribb's Creek (Fig. 33f). Grows in subalpine woodland.

Etymology: The epithet alludes to its habitat (L: *niveus*, snow, and *planus*, plain).

Notes: Plants seen growing at Howitt Plain in Victoria were many-stemmed. *Senecio niveoplanus* is similar in indumentum and capitulum size to *S. prenanthoides* but leaves are not crowded basally and are much broader and more lobed above mid stem, bracts and bracteoles are longer, and achenes are glabrous and not lageniform. *Senecio gunnii* has a similar leaf shape but its stems and leaves are not coarse-hairy, leaves are shorter, auricles are less developed, capitula have more florets and achenes are generally sparsely haired.

Selected specimens examined: **AUSTRALIAN CAPITAL TERRITORY:** Cribbs Creek, upper Cotter Valley, Namadgi National Park, *P. Gilmour 6455*, 3.i.1988 (CBG). **VICTORIA:** 73 miles [115 km] north of Heyfield, ca. 39 miles [60 km] north of Licola, beyond Trapyard Hill, *J.*

NATIONAL HERBARIUM OF VICTORIA (MEL)
MELBOURNE, AUSTRALIA
MEL 217,074
319 ASTERACEAE
Senecio niveoplanus I.Thomps.
HOLOTYPE
Coll: Thompson, I.R. 758 Date: 06 Feb 2002
AUSTRALIA VICTORIA
Region/District: Snowfields
Locality: Alpine National Park. N end of Hewitt's Plain, c. 300 metres along Bogong Country Track from intersection with Hewitt's Plain Road.
Lat. 37°13'S Long. 146°41'E
Vic. Grid Ref.: S 17
Notes: Snow Gum woodland. Senecio gunnii, Senecio pinnatifolius also present.
Robust plant c. 1 metre tall, several stems from base
About 5 small colonies seen in general area
Det.: Thompson, I.R. 31 May 2002
Duplic. AD, CANB, HO, NSW
HOLO-
TYPE
NATIONAL HERBARIUM OF

Figure 39. *Senecio niveoplanus* (holotype: *I.R. Thompson 758* MEL).

Carrick 3146, 20.i.1972 (AD); 4 m. [7 km] NW of Falls Creek, Kiewa area, *A.C. Beauglehole 22383*, 24.i.1967 (MEL); Dargo High Plains, Lightbound Creek, *A.C. Beauglehole 41658*, 23.iii.1973 (MEL).

29. *Senecio prenanthoides* A.Rich., in J.S.C. Dumont d'Urville, *Voy. Astrolabe* 2: 96 (1834).

Type: [New South Wales], 'Creseit in Novae Hollandiae, loco dicto Port Jackson' [Sydney], *Gaudichaud 4*; holo: P.

S. tenuiflorus sensu N.G.Walsh, *Fl. Victoria* 4: 962 (1999), *p.p.*

S. sp. aff. *tenuiflorus sensu* J.H. Ross in *Census of Vascular Plants in Victoria* 5 (1996).

S. sp. C forms 1 and 2 *sensu* M.E. Lawrence, *Australian J. Bot.* 28: 155 (1980).

S. sp. E *sensu* G.J. Harden, *Flora of New South Wales* 3: 305 (1992) *p.p. maj.*

Herbs to 0.6 m high. *Taproot* inconspicuous; secondary roots fleshy, often tuberiform, 1–2.5 mm diam. *Stems* erect; coarse-hairy in lower third sometimes with a cottony overlay, variably glabrescent, coarse hairs giving way to a sparse appressed-cottony indumentum or stems becoming glabrous. *Leaves in middle third of stems* becoming distinctly wider spaced and narrower upwards, oblanceolate to narrow-oblanceolate, or linear, 6–17(–22) cm long, l:w ratio c. 4–13, not dissected or occasionally 1 or 2 triangular to narrow-triangular lobes per side in proximal half; base attenuate; margin entire or with frequent denticulations or teeth; both surfaces coarse-hairy; lower surface commonly purple. *Uppermost leaves* narrow-lanceolate or linear to narrow-linear, l:w ratio c. 7–30, sometimes lobate in proximal quarter; margin entire or dentate proximally; base sometimes with small, entire auricles, not amplexicaul; surfaces coarse-hairy giving way to glabrous or slightly cobwebby upwards. *Unit inflorescences* of several to many capitula; total number of capitula per stem often 20–60; overtopping marked; mature lateral peduncles mostly 8–30 mm long. *Capitula*: calyculur bracteoles 3–5, 1.5–2.5 mm long; peduncle and margin of bracteoles slightly cobwebby or glabrous at anthesis; involucre (5.0–)6.0–9.0 mm long, 1.3–1.6 mm diam.; phyllaries 8–13, glabrous, with apex erect; stereomes (in dried specimens) ±flat or gently convex, green or occasionally somewhat purple, commonly minutely black at tip, sometimes purple in a zone c. 1 mm long below tip; post-fructescence receptacle 2–2.5 mm diam., with phyllaries commonly finally reflexed. *Florets* 15–35, c. 70% female, corolla-lobes triangular, thickened apically; corolla of bisexual florets 6.5–8 mm long, mostly 5-lobed; corolla-lobes of female florets 4, 0.2–0.3 mm long. *Achenes* lageniform, 2.8–4.5 mm long, orange-brown, or (in bisexual florets) dark brown, with papillose hairs scattered in lines, l:w ratio of hairs c. 1–2. *Pappus* 6–8 mm long. (Figs 1c, 2b, 41)

Flowers late spring–autumn.

Distribution and Habitat: Occurs in eastern Australia. Apart from a northern outlier at Mt Fox, it extends from the Blackdown Tableland in south-eastern Queensland south through eastern New South Wales, Victoria and Tasmania to Huon Island in southern Tasmania. Also extends west from far eastern Victoria to the Adelaide region in south-eastern South Australia (Fig. 40a). Grows in sandy and loamy soils, in scrub, woodland, and forest, from sea-level to 1500 m.

Notes: One of several species forming a rosette of leaves until the phase of rapid elongation leading up to flowering. As flowering commences, leaves tend to be relatively crowded and are significantly broader in the lower half of the plant. In this respect, as well as in the type of leaf indumentum and capitular dimensions, *S. prenanthoides* is similar to *S. phelleus*. Both of these species have recently been identified as *S. tenuiflorus*, in particular in South Australia and Victoria where they are both common. In Walsh (1999), the form of *S. tenuiflorus* with rostrate achenes is referable to *S.*

Figure 40. Distribution of a. *Senecio prenanthoides*; b. *S. psilophyllus*; c. *S. lageniformis*; d. *S. nigrapicus*; e. *S. longipilus*; f. *S. oldfieldii*.

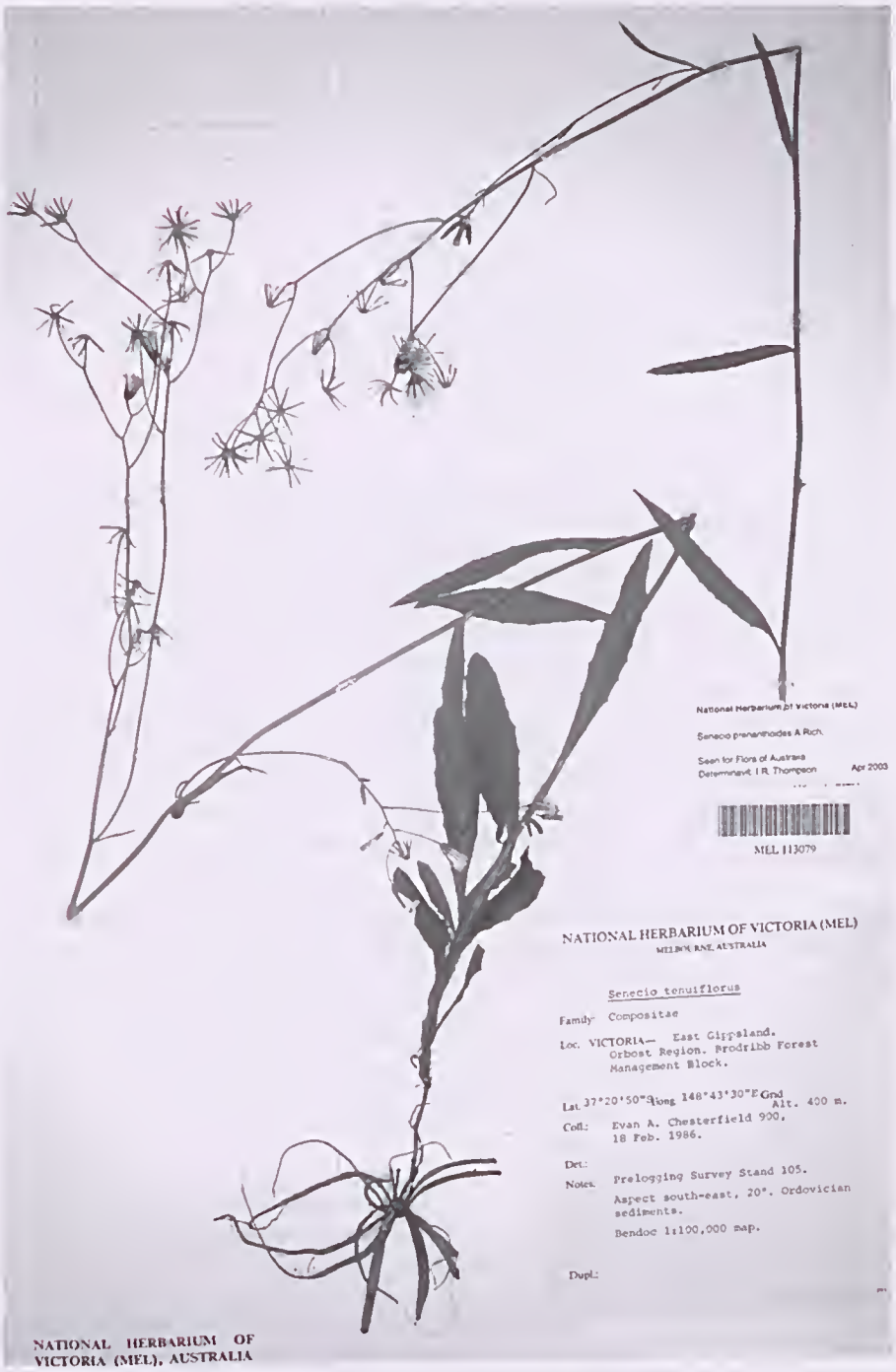

Figure 41. *Senecio prenanthoides* (*E.A. Chesterfield 900* MEL).

prenanthoides and the form with non-rostrate achenes is referable to *S. phelleus*. The form with a dense cover of coarse hairs also mentioned under *S. tenuiflorus* in this flora is referable to *S. hispidissimus*.

Senecio prenanthoides differs from *S. phelleus* by having slightly tuberiform roots, basal regions of stems with coarse hairs, auricles when present, not sagittate or amplexicaul, phyllaries sometimes fewer and usually finally reflexed, and achenes longer and lageniform. Populations in Victoria and South Australia have capitula with a higher length:diameter ratio than occurs in *S. phelleus*, but further north this distinction is lost.

The type collection, collected from the Sydney area, is of only the upper stem region and inflorescence. However, the presence of coarse hairs on the lowermost leaf of the specimen (disconnected and found in envelope) and the shape of the achenes enable it to be matched to this widespread species. The description by the author, A. Richard, is typically unhelpful.

Hybrids have been recognised between this species and *S. hispidulus*, *S. glandulosus*, and *S. glabrescens*.

Selected specimens examined: **SOUTH AUSTRALIA:** Lenswood Recreation Park, *R. Bates 9250*, 8.ii.1987 (AD); Big Heath Reserve, *D. Hunt 2577*, 4.xi.1965 (AD); Padthaway, ca. 40 km SSW of Bordertown, *P. Canty*, 23.x.1980 (AD); Caroline State Forest, c. 15 km south-south-east of Mt Gambier, *P. Wilson 1318*, 17.xi.1959 (AD); Mt Burr, 5 km south of summit, *R. Bates 7689*, 26.x.1986 (AD); Mt Lofty Range, *E.H. Ising*, 10.iv.1927 (AD). **QUEENSLAND:** Kroombit Tops State Forest, *E.J. Thompson BIL94, G.P. Turpin & P.I. Forster*, 16.ii.1995 (BRI); Jolly's Lookout, D'Aguilar Range, *S.T. Blake 21051*, 31.x.1959 (BRI); Mt Gravatt, near Brisbane, *C.T. White*, 8.iv.1931 (BRI); Blackdown Tableland ca. 32 km SE of Blackwater, *R.J. Henderson 856, S.B. Andrews & P. Sharpe*, 26.iv.1971 (BRI); Moreton Island, *C.T. White*, Sept 1908 (BRI); Baldy right (nth) Bunya Mountains, *R.J. Fairfax 203*, 14.iii.1995 (BRI). **NEW SOUTH WALES:** Middle Arm Travelling Stock Reserve, 24.5 km directly north of Goulburn, *I. Crawford 5090*, 14.xii.1998 (CANB); Tinderry Mountains, *T.G. Hartley 13601*, 12.iii.1972 (CANB); Southern Tablelands: Bombala River, c. 17 km NE of Bibbenluke, north of confluence with Back Creek, *I. Crawford 740*, 21.xii.1987 (CBG); Northern Tablelands, Barrington Swamp, Barrington Tops, *W.M. Dowling BT 12/6 & A. Heinrich*, 30.i.1998 (CANB); Warra SF, east Llangothlin, 300m south Crown Mtn FR gate, *J.T. Hunter 2684*, 1996 (NE); Northern Tablelands, Dodds Trail, 1 km ESE of north entrance to Single National Park, *L.M. Copeland 2156*, 12.xi.1999 (NE); east boundary of Goonoowigall BR, 13 km SE of Inverell, Arm Rd, *G.J. White, D.M. Bell & M.B. Henderson*, 22.xii.1992 (NE); Warrabah National Park, *J.R. Hosking 801*, 25.ix. 1989 (CBG, MEL, NE, NSW). **AUSTRALIAN CAPITAL TERRITORY:** "80 acres", Cotter Hut Road, upper Cotter Valley, Namadgi National Park, *P. Gilmour 6395*, 1.i.1988 (CBG); Summit of Stockyard Spur, 2.5 km WSW of Corin Dam Wall, *B.J. Lepschi 735*, 1.iii.1992 (CANB). **VICTORIA:** Nepean State Park, *A.C. Beauglehole 71276 & L.K.M. Elmore*, 9.xi.1982 (MEL); Near Mallacoota, Genoa Peak, 10 km from Princess hwy, End of track, *B. Nordenstam & A. Anderberg 1294*, 12.xi.1989 (MEL); Carpendeit Reference Area, 32 km WSW of Colac PO, *A.C. Beauglehole 67286*, 13.xii.1979 (MEL); 9 m [14 km] NNW of Dergholm PO, *A.C. Beauglehole 37946*, 25.xi.1971 (CANB, MEL); Just west of the Lakes National Park, Sperm Whale Head, *T.B. Muir 2309*, 13.x.1961 (MEL); Grampians, Jimmy Creek area, 26 km south of Hall's Gap, *A.C. Beauglehole 66959*, 6.xii.1979 (MEL); Snowfields, Clover Flat, west side of Moroka Road, 47 km NE of Licola, Licola is 257 km east of Melbourne, *P. C. Jobson 1981*, 7.iii.1993 (BRI, MEL); Gippsland Plain, Morwell National Park, *K. Harris s.n.*, 12.xii.1992 (MEL); East Gippsland, Orbost Region, Brodribb Forest Management Block, *E. A. Chesterfield 777*, 11.ii.1986 (MEL); Discovery Bay Coastal Park, Swan Lake Rd c. 5 km north of Swan Lake, *I.R. Thompson 736 & J. Stubbings*, 1.i.2002 (MEL). **TASMANIA**: By Channel Highway, opposite Huon Island, about 30 miles S. of Hobart, *R. Melville 2422, J. Willis & W. Curtis* (MEL); Mt Maria Track, Maria Island, *A.M. Buchanan 2028*, 10.xii.1983 (CANB, HO); Oakden Hill, *A. Moscal 8770*, 7.xi.1984 (CANB, HO); Barnes Gully area, Magra, *F. Duncan 1401*, 27.xi.1985 (HO); Hardwickes Hill, east of summit, *A.M. Buchanan 1770*, 24.xi.1983 (HO); River Ouse – Monpeelyata Canal, *A. Moscal 6483a*, 24.ii.1984 (HO).

30. *Senecio psilophyllus* I.Thomps., *sp. nov.*

A *S. prenanthoides* A.Rich. caulibus et foliis glabris, caulibus aequaliter foliosis, foliis tenuioribus differt.

Type: Australian Capital Territory, Booderee National Park, c. 200 m SW along foreshore from Murray's boat ramp, *N.M. Taws 540*, 31 July 1996; holo: CANB.

Herbs to 0.4 m high. *Taproot* inconspicuous; secondary roots fleshy, slightly tuberiform, 1–2 mm diam. *Stems* erect, glabrous. *Leaves in middle third of stems* more or less evenly spaced and sized, linear to narrow-linear, 10–13 cm long, l:w ratio c. 10–14, not dissected; base cuneate; margin mostly callus-denticulate or with a few remote teeth, mostly proximal; surfaces glabrous or short, coarse hairs present on margin of lower leaves; lower surface green or tinged purple. *Uppermost leaves* similar; base sometimes with small auricles, not amplexicaul. *Unit inflorescences* of several to many capitula; total number of capitula per stem c. 40; overtopping slight; mature lateral peduncles mostly 8–20 mm long. *Capitula*: calycular bracteoles 3–5, 1.0–1.5 mm long; peduncle and margin of bracteoles glabrous at anthesis; involucre 6.0–7.5 mm long, 1.3–1.6 mm diam.; phyllaries 8–13, glabrous, with apex erect; stereomes (in dried specimens) flat or gently convex, green, sometimes minutely black at tip and/or purple in a zone c. 1 mm long below tip; post-fructescence receptacle 2 mm diam., the phyllaries ?finally reflexed. *Florets* 20–25, c. 70% female; corolla-lobes narrow-triangular, moderately thickened apically; corolla of bisexual florets 6 mm long, 5-lobed; corolla-lobes of female florets 3 or 4, c. 0.2 mm long. *Achenes* lageniform, 3.0–3.5 mm long, light brown, with papillose hairs in lines, l:w ratio of hairs 1–2. *Pappus* c. 6 mm long. (Fig. 42)

Flowers autumn–winter.

Distribution and Habitat: Occurs in the Australian Capital Territory in Booderee National Park, on the southern margin of Jervis Bay. A possible disjunct record is recorded from near Scone (Fig. 40b). Grows in pale grey sand on the coast in open forest.

Etymology: The epithet alludes to the nearly glabrous mature leaves (Gk: *psilos*, naked, and *phyllus*, leaf).

Notes: Currently this species is known only from the Booderee National Park south of Jervis Bay, where it has been collected from three different sites several kilometres apart. Similar to *S. prenanthoides*, particularly in capitulum, achene, and root morphology, but with stems and leaves (except for the margin) glabrous, leaves not crowded basally, and achenes more densely papillose.

Selected specimens examined: **NEW SOUTH WALES**: Woolooma Mt, Beltrees, Scone, *A.L. White*, Nov. 1903 (NSW). **AUSTRALIAN CAPITAL TERRITORY**: Track to Steamer's Beach, Booderee National Park, *I.R.Thompson 790*, 23.ix.2003 (MEL).

31. *Senecio lageniformis* I.Thomps., *sp. nov.*

A *S. quadridentato* Labill. indumento sparsiore, caulibus repentibus, plerumque brevioribus, capitulis latioribus, flosculis hermaphroditis pluribus differt.

Type: New South Wales, Kosciuszko National Park, Long Plain, near confluence of Murrumbidgee River and Boundary Creek, *I.R. Thompson 747 & N.G. Walsh*, 31 Jan. 2002; holo: MEL; iso: AD, CANB, HO, NSW.

Senecio sp. 2 *sensu* N.G. Walsh, *Fl. Victoria* 4: 962 (1999).

Senecio sp. N *sensu* G.J. Harden, *Fl. New South Wales* 3: 306 (1992), *p.p.*

Herbs to 0.4 m high. *Root system* not seen. *Stems* creeping then ascending to erect; ±glabrous or transiently sparsely cottony. *Leaves in middle third of stems* commonly becoming wider spaced and broader upwards, oblanceolate 4–8(–10) cm long, l:w ratio c. 4–10, not dissected; base attenuate; margin with scattered denticulations or teeth;

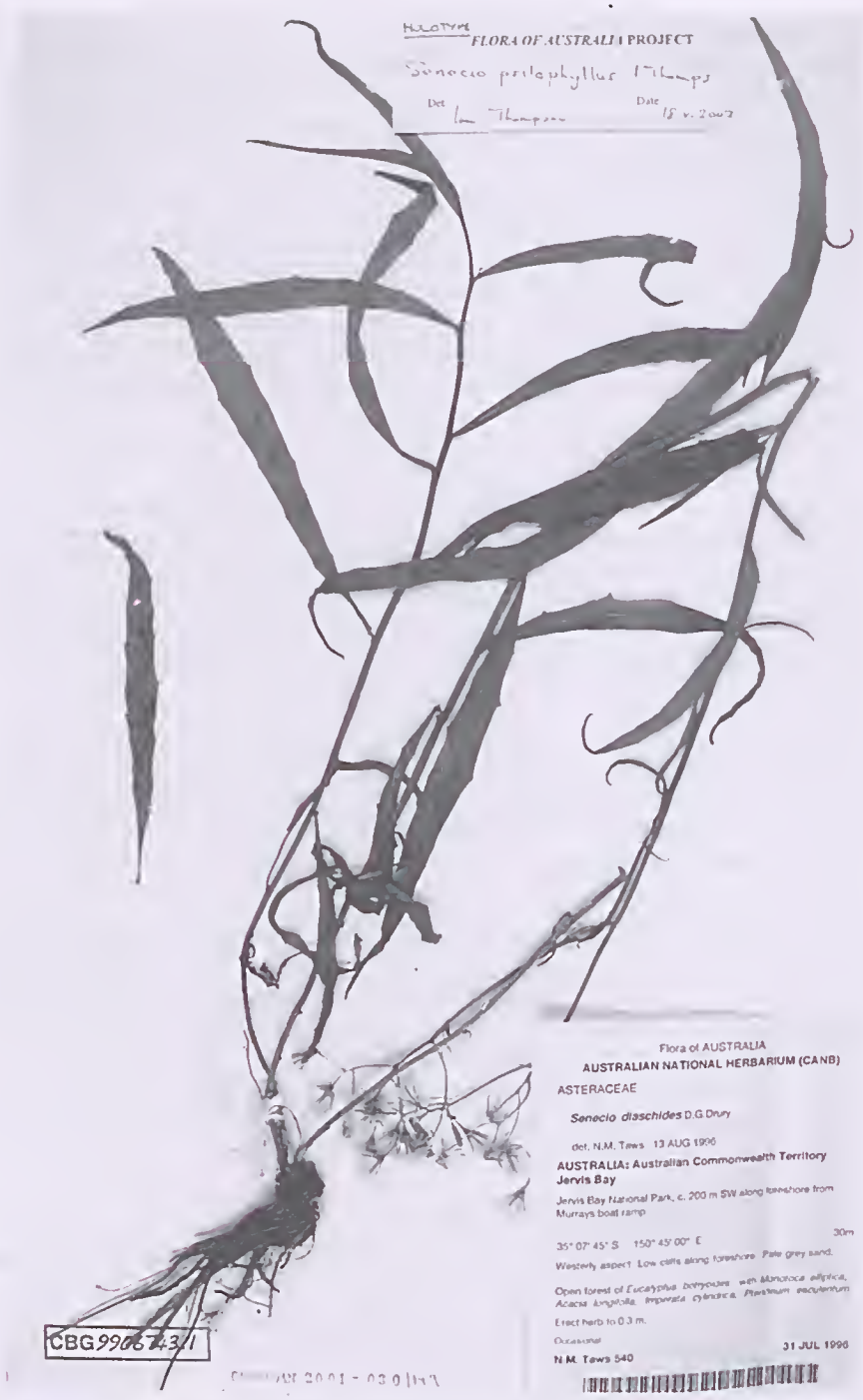
HOLOTYPE
FLORA OF AUSTRALIA PROJECT
Senecio psilophyllus I.Thomps
Det I.R. Thompson
Date 15 v. 2007
Flora of AUSTRALIA
AUSTRALIAN NATIONAL HERBARIUM (CANB)
ASTERACEAE
Senecio diaschides D.G.Drury
det. N.M. Taws 13 AUG 1996
AUSTRALIA: Australian Commonwealth Territory
Jervis Bay
Jervis Bay National Park, c. 200 m SW along foreshore from Murrays boat ramp
30m
35° 07' 45" S 150° 45' 00" E
Westerly aspect Low cliffs along foreshore Pale grey sand.
Open forest of Eucalyptus botryoides with Monotoca elliptica, Acacia longifolia, Imperata cylindrica, Pteridium esculentum
Erect herb to 0.3 m.
Occasional
31 JUL 1996
N.M. Taws 540
CBG

Figure 42. *Senecio psilophyllus* (holotype: *N.M. Taws 540* CANB).

surfaces glabrous or minutely scabridulous; lower surface green. *Uppermost leaves* very narrow-elliptic to narrow-linear, l:w ratio c. 7–20; base sometimes with small, entire auricles, not amplexicaul. *Unit inflorescences* of several to many capitula; total number of capitula per stem often 5–40; not or only slightly overtopping; mature lateral peduncles mostly 15–40 mm long. *Capitula*: calycular bracteoles 3–5, 1.5–2.5 mm long; peduncle and margin of bracteoles cobwebby at anthesis; involucre 6.0–8.0 mm long, c. 2.0–2.6 mm diam.; phyllaries mostly 12–14, cobwebby or glabrous, with apex erect; stereomes (in dried specimens) ±flat, green or tinged purple, occasionally minutely black at tip, commonly purple in a zone c. 1 mm long below tip; post-fructescence receptacle 3–4 mm diam., with phyllaries commonly finally spreading. *Florets* 50–60, c. 70% female; corolla-lobes triangular, slightly thickened apically; corolla of bisexual florets 6–7 mm long, 4- or 5-lobed; corolla-lobes of female florets 3 or 4, 0.2–0.3 mm long. *Achenes* lageniform, 3.5–4.5 mm long, dark brown, with papillose hairs scattered in lines, l:w ratio of hairs 1–2. *Pappus* 5–6 mm long. (Fig. 43)

Flowers summer–autumn.

Distribution and Habitat: Occurs in far south-eastern Australia from Long Plain near Kiandra in far south-eastern New South Wales south-south-west to Bentley Plains in eastern Victoria (Fig. 40c). Grows in grasslands, herbfields, low open heathland, or grassy open woodland in subalpine areas.

Etymology: The epithet alludes to the achenes, which resemble a slender bottle (L: *lageniformis*, flask-shaped).

Notes: Allied to *S. quadridentatus*, *S. prenanthoides* and several other species in achenial morphology and in the number and size of calycular bracteoles. It differs mostly in habit, diameter of involucre, and in the high number of bisexual florets. The undissected leaves help to distinguish this species from other subalpine species.

Selected specimens examined: **NEW SOUTH WALES:** Kosciuszko National Park, Long Plain, c. 100 m west of confluence of Boundary Ck and Murrumbidgee R, *N.G. Walsh 4886 & K. McDougall*, 9.xii.1998 (MEL); Kosciuszko National Park, Nungar Plain, knoll c. 2 km due east from western extremity of plain, north side of Nungar Ck, *N.G. Walsh 5512, K. McDougall & J. Walsh*, 11.xii.2001 (MEL). **VICTORIA:** East Gippsland, Rocky Plain, *A.C. Beauglehole 35860 & K.C. Rogers*, 6.i.1971 (MEL); 1.5 km north-east along Cowombat Flat track from its intersection with the Limestone Road, *D. E. Albrecht 3009*, 24.i.1987 (MEL); Forlorn Hope Plain, Nunniong Plateau, *D.E. Albrecht 1394*, 30.xii.1984 (MEL); East Gippsland, Benambra–Wulgulmerang Road, Native Dog Plain, Buchan River area, *A.C. Beauglehole 33321, K.C. Rogers & E.W. Finck*, 7.i.1970 (MEL).

32. *Senecio nigrapicus* I.Thomps., *sp. nov.*

A *S. squarrosa* A.Rich. pilis grossis caulis persistantioribus, foliis plerumque non auriculatis, pedunculis brevioribus, capitulis pluribus parvioribus, phyllariis paucioribus macula anthracina apicali majore, acheniis dilute lageniformibus differt.

Type: Victoria, Alpine National Park, Dimmick's Lookout, c. 10 km south of Howitt Plains, *I.R. Thompson 760*, 6 Jan. 2002; holo: MEL; iso: CANB, NSW

Herbs to 0.8 m high. *Taproot* well-developed; secondary roots mostly fine, 0.5–1 mm diam. *Stems* coarse-hairy in lower third giving way to mildly appressed-cottony or glabrous upwards. *Leaves in middle third of stems* more or less evenly spaced and sized, narrow-oblanceolate or very narrow-elliptic, 7–10 cm long, l:w ratio c. 4.5–13, not dissected or lobate; segments 3–5 per side largely in middle third, antrorse, triangular; base attenuate; margin with scattered denticulations or teeth; upper surface a rather pale grey-green, sparsely scabridulous or glabrous; lower surface pale green, sparsely coarse-hairy, cobwebby, or glabrous. *Uppermost leaves* narrow-elliptic or linear, l:w ratio c. 5–20, commonly appearing undissected and with entire margin due to rolling of lamina; base

HOLO-
TYPE
NATIONAL HERBARIUM OF
VICTORIA (MEL), AUSTRALIA
NATIONAL HERBARIUM OF VICTORIA (MEL)
MELBOURNE, AUSTRALIA
MEL 2173068
319 ASTERACEAE
Senecio lageniformis I.Thomps.
HOLOTYPE
Coll: Thompson, I.R. 747 Date: 31 Jan 2002
Addit. Coll: Walsh, N.G.
AUSTRALIA: NEW SOUTH WALES
Region/District: Southern Tablelands
Locality: Kosciuszko National Park, Long Plain, c. 300
metres NNE along Long Plain Road from intersection with
Port Philip Trail
Lat.: 35°41'35"S Long: 148°33'04"E.
Notes: Grassland/herbfield. Also present: Senecio exiensus,
Senecio gunnii, Senecio longipilus.
Plants to 30 cm high. Stems several, ascending to erect.
Common.
Det: Thompson, I.R. 11 May 2003
Dupls: AD, CANB, HO, NSW

Figure 43. *Senecio lageniformis* (holotype: *I.R. Thompson 747* MEL).

attenuate or sometimes auriculate, with aurieles divided, hardly amplexieaul; surfaces glabrous or slightly eobwebby. *Unit inflorescences* of many capitula; total number of capitula per stem often 30–100; not overtopping or overtopping slight; mature lateral peduncles mostly 10–20 mm long. *Capitula*: calycular braeteoles 8–12, 2.0–3.0 mm long; pedunele and margin of bracteoles glabrous or often eobwebby at anthesis; involucre 6–8 mm long, c. 2.2–2.8 mm diam.; phyllaries mostly 12–14, glabrous, with apex often reflexed; stereomes (in dried speeimens) thiekened, flat or gently eonvex, green or tinged purple, black at tip, the mark relatively large; post-fructescence reeeptaele 3–3.5 mm diam., with phyllaries commonly finally erect. *Florets* 40–60, e. 80% female, eorolla-lobes ±oblong, moderately thiekened apieally; eorolla of bisexual florets 5–6.5 mm long, 5-lobed; eorolla-lobes of female florets 4 or 5, 0.2–0.3 mm long. *Achenes* narrow oblong-ellipsoid or slightly lageniform, 2.5–3.0 mm long, red-brown or brown, long with papillose hairs,) in dense bands, l:w ratio of hairs e. 3–5. *Pappus* 5–6 mm long. (Fig. 44)

Flowers summer–autumn.

Distribution and Habitat: Oeeurs predominantly in eastern Australia: from Mt Timbertop in eastern Victoria east to Wulgulmerang then north-east to the Brindabella Ranges in the Australian Capital Territory; and disjunetly mueh further north around Guyra in north-eastern New South Wales and in the Bunya Mtns in south-eastern Queensland where known from a single old reeord (Fig. 40d). Grows in forest and woodland in lowland areas or at elevations over 800 m.

Etymology: The epithet alludes to the relatively prominent black mark on the apex of the phyllaries (L: *niger*, black, and *apex*, tip)

Notes: Similar in capitular dimensions and leaf shape to *S. multicaulis* but differs by having leaves, when disseeted, with more numerous lobes and with relatively smaller auricles, a more prominently black-marked apex on phyllaries, less overtopping in infloreseences, and slightly lageniform aehenes. Similar to *S. interpositus* but with eoarse-hairy lower stems and with a higher pereentage of florets female.

Selected specimens examined: **QUEENSLAND:** Bunya Mts, *C.T. White*, Oct. 1919 (BRI). **NEW SOUTH WALES:** 10 km south of Ben Lomond, in railway reserve, *R. Bates 13731*, 1.i.1988 (AD). **AUSTRALIAN CAPITAL TERRITORY**: Smokers Gap, *L.G. Adams 4137*, 17.iv.1984 (CANB); Eastern slopes of Mt Tennent, near Tharwa, *P. Gilmour 6085*, 22.xii.1986 (CBG). **VICTORIA:** Splitters Range. Spring Hill Track, c. 1 km from intersection with Lees Track, c. 12 km east of Omeo, *I.R. Thompson 725*, 4.xii.2001 (BRI, HO, MEL, NSW); Mt Timbertop, *D.E. Albrecht 1565*, 28.i.1985 (MEL); 4 miles [7 km] north-east of Mt Arbuckle, on the Doolan Plains road, *T.B. Muir 4531*, 17.i.1967 (MEL); East Gippsland. Wulgulmerang, Little River, K. C. Roger's property, *A.C. Beauglehole 36132*, 15.i.1971 (MEL, NSW).

33. *Senecio longipilus* I.Thomps., *sp. nov.*

A *S. squarroso* A.Rieh. pilis grossis caulis persistantioribus, lobis foliorum plerumque apieem versus, pilis grossis foliorum longioribus, phyllariis plerumque paueioribus et latioribus non purpureis apieem versus macula anthracina apicali majore, acheniis dilute lageniformibus differt.

Type: New South Wales, Koseiuszko National Park, Long Plain, near confluence of Boundary Creek and Murrumbidgee River beside Long Plain Road, *I.R.Thompson 748 & N.G.Walsh*, 31 Jan. 2002; holo: MEL; iso: NSW, CANB, HO, PERTH.

Senecio sp. N *sensu* G.J. Harden, *Fl. New South Wales* 3: 306 (1992), *p.p.*

Herbs to 0.5 m high. *Taproot* obseure; secondary roots fleshy, 0.5–2 mm diam. *Stems* erect or ascending to erect; densely coarse-hairy, sometimes with a eottony overlay, density reducing upwards and predominantly appressed-cobwebby near summit. *Leaves* in middle third of stems more or less evenly spaced and sized or becoming wider spaced

Figure 44. *Senecio nigrapicus* (holotype: *I.R. Thompson 760* MEL).

and narrower upwards, oblanceolate to narrow-elliptic, 7–15 cm long, l:w ratio c. 5–8, not dissected or coarse-dentate to lobate; segments 3–6 per side largely in distal half, antrorse, triangular; base attenuate or cuneate; margin entire or with scattered denticulations distally; upper surface coarse-hairy, with hairs rather long (to 2 mm); lower surface green, glabrous except for coarse-hairy midrib. *Uppermost leaves* narrow to very narrow-elliptic, l:w 5–8; base attenuate; coarse-hairy indumentum persisting especially on margin and present on margin of bracts also. *Unit inflorescences* of several to many capitula; total number of capitula per stem often 20–60; overtopping variable; mature lateral peduncles mostly 10–30 mm long; peduncular bracteoles rather long. *Capitula*: calycular bracteoles 6–8, 3.0–5.0 mm long; peduncle sparsely cobwebby or glabrous but margin of bracteoles ciliate at anthesis; involucre (5.0–)6.0–8.0 mm long, 2.8–3.5 mm diam., phyllaries 12–15(–18), glabrous or sparsely cobwebby, with apex erect; stereomes (in dried specimens) thickened, flat, green or sometimes tinged purple, black at tip, the mark relatively large; post-fructescence receptacle 4–5 mm diam., the final phyllary orientation unclear. *Florets* 40–60, c. 80% female; corolla-lobes oblong, much thickened apically; corolla of bisexual florets 6.5–8 mm long, 5-lobed; corolla-lobes of female florets 4 or 5, c. 0.3 mm long. *Achenes* narrow oblong-ellipsoid or slightly lageniform, 2.5–3.0 mm long, red-brown or dark brown, with papillose hairs in dense bands, l:w ratio of hairs c. 3–4. *Pappus* 6–8 mm long. (Fig. 45)

Flowers summer.

Distribution and Habitat: Occurs in far south-eastern New South Wales in the Kiandra area, and in northern Tasmania near Perth. All records from Tasmania are old (Fig. 40e). Grows in sand or loam soils in grassland, herbfields, shrubland and woodland, mostly at elevations over 1000 m but sometimes lowland.

Notes: Distinguishable from other species with broad capitula by the relatively long (1–2 mm) coarse hairs on stems, leaves and bracts, and the relatively long bracts and peduncular bracteoles. Phyllaries are fewer than in *S. macrocarpus* and is usually fewer than in *S. squarrosus*. The apex of phyllaries is typically strongly black-marked, a character it shares with *S. nigrapicus* and *S. oldfieldii*. The pappus is usually relatively densely bristled and relatively long, and it commonly exceeds the florets by c. 1 mm, obscuring them at anthesis. Pappus bristles are more scabrid-barbellate than in other related species. Compared to *S. squarrosus* the stereomes of the phyllaries are broader and this distinction is most evident in the distalmost 1.5 millimetres of the phyllary.

Selected specimens examined: **NEW SOUTH WALES:** Kosciuszko National Park, Long Plain, near confluence of Boundary Creek and Murrumbidgee River beside Long Plain Rd, *I.R. Thompson 748 & N.G. Walsh*, 31.i.2002 (NSW, CANB, HO, PERTH); Kosciuszko National Park, c. 100 m west of confluence of Boundary Creek and Murrumbidgee River, *N.G. Walsh 4885 & K.L. McDougall*, 9.xii.1998 (MEL); Upper Snowy River, *F. Mueller*, Jan. 1855 (MEL); Kosciuszko National Park, Port Philip Trail, *I.R. Thompson 752 & N.G. Walsh*, 31.i.2002 (BRI, MEL). **TASMANIA**: near Perth, South Esk R., *R.C. Gunn 767* (MEL).

34. *Senecio oldfieldii* I.Thomps., *sp. nov.*

A *S. squarroso* A.Rich. pilis grossis caulis longioribus persistantioribus, capitulis angustioribus, phyllariis paucioribus non purpureis apicem versus macula anthracina apicali majore differt.

Type: Western Australia, near centre road through Perup Field Centre, south drainage line, *A. R. Annels ARA 4699 & R. W. Hearn*, 21 Oct. 1994; holo: PERTH.

Herbs to 1.0 m high. *Roots* unknown. *Stems* erect, densely coarse-hairy, density reducing to sparse or glabrous near summit, not cottony. *Leaves in middle third of stems* sometimes becoming distinctly more widely spaced and narrower upwards, oblanceolate, very narrow-elliptic or linear, 7–15 cm long, l:w ratio c. 5–14, coarse-dentate to deeply

HOLO-
TYPE
NATIONAL HERBARIUM OF VICTORIA (MEL)
MELBOURNE, AUSTRALIA
Senecio longipilus I.Thomps.
HOLOTYPE
AUSTRALIA NEW SOUTH WALES
Locality Kosciuszko National Park Long Plain, near confluence of Boundary Creek and Murrumbidgee River, beside Long Plain Road
Lat 35°41'35"S Long 148°33'05"E
Herb with an erect stems to 30 cm tall
Dr Thompson I.R.
Duplicates CANB, HO, NSW, PERTH
NATIONAL HERBARIUM OF

Figure 45. *Senecio longipilus* (holotype: *I.R. Thompson 748 & N. G. Walsh* MEL).

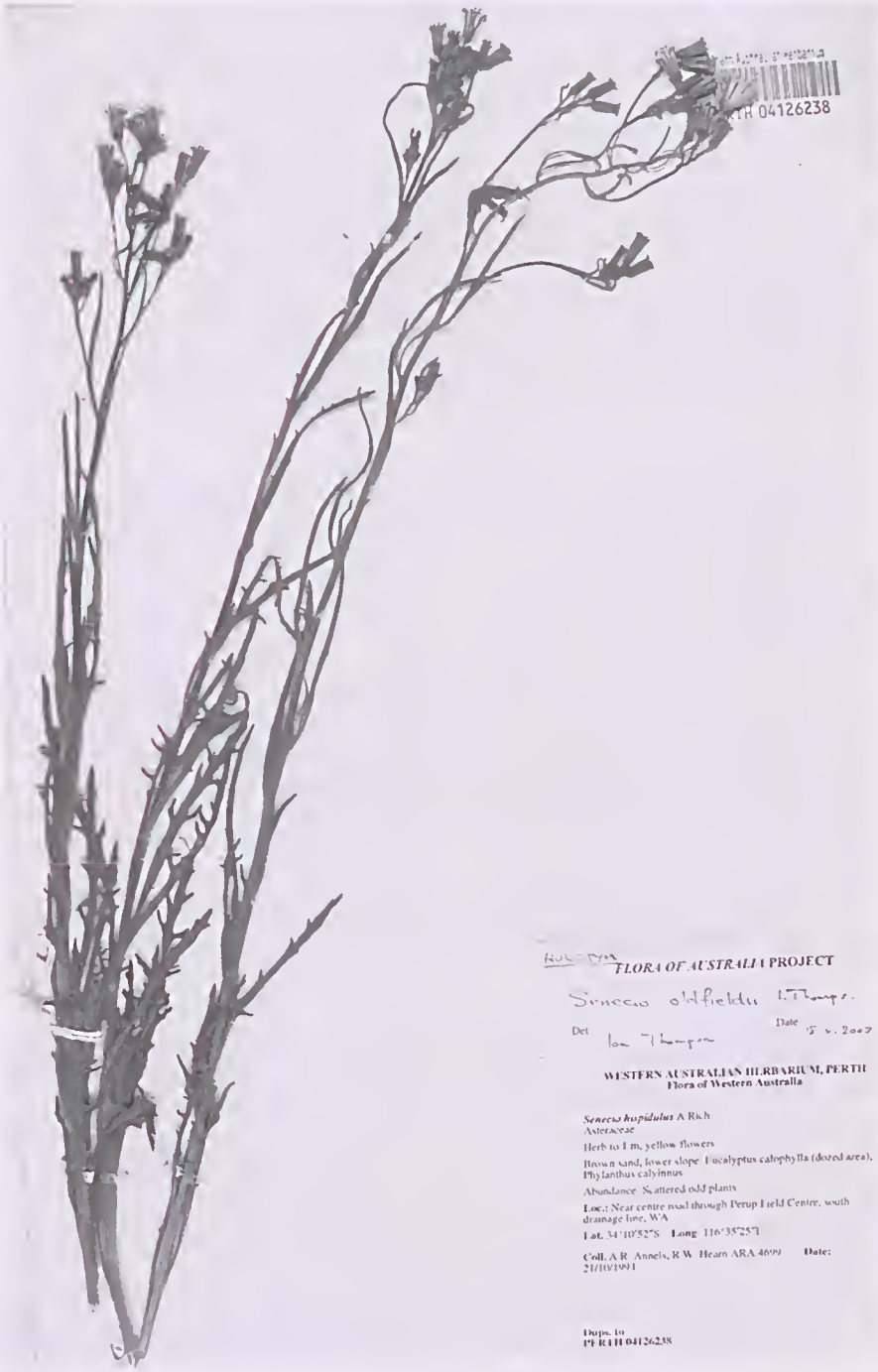
PERTH 04126238
FLORA OF AUSTRALIA PROJECT
Senecio oldfieldii I.Thomps.
Det Ian Thompson
Date 5 v. 2007
WESTERN AUSTRALIAN HERBARIUM, PERTH
Flora of Western Australia
Senecio hispidulus A.Rich
Asteraceae
Herb to 1 m, yellow flowers
Brown sand, lower slope Eucalyptus calophylla (dotted area), Phylanthus calycinus
Abundance Scattered odd plants
Loc.: Near centre road through Perup Field Centre, south drainage line, WA
Lat. 34°10'52"S Long 116°35'25"I
Coll. A.R. Annels, R.W. Hearn ARA 4699 Date: 21/10/1991
Dups. to
PERTH 04126238

Figure 46. *Senecio oldfieldii* (holotype: *A.R. Annels 4699 & R. W. Hearn* PERTH).

lobate; segments 3–5 per side slightly more frequent in distal half, antrorse, triangular to narrow-triangular; base attenuate; margin ±entire; upper surface coarse-hairy, with rather long hairs (0.5–2 mm); lower surface possibly always green, glabrous except for coarse hairs on midrib and major veins. *Uppermost leaves* linear to narrow-linear, l:w ratio c. 10–20; base attenuate; coarse-hairy indumentum persisting and present on margin of bracts also. *Unit inflorescences* of several capitula; total number of capitula per stem often 5–20; overtopping not marked; mature lateral peduncles not seen, immature ones 10–30 mm long; peduncular bracteoles rather long. *Capitula*: calycular bracteoles 8–10, 3.0–5.0 mm long; peduncle sparsely cobwebby or glabrous, margin of bracteoles ciliate at anthesis; involucre 8.5–10.0 mm long, c. 3 mm diam.; phyllaries c. 13, glabrous, with apex reflexed or distorted; stereomes (in dried specimens) thickened, flat, green, black at tip, the mark relatively large; post-fructescence receptacle not seen. *Florets* c. 60, c. 70% female, corolla-lobes oblong, much thickened apically; corolla of bisexual florets 9–10 mm long, 5-lobed; corolla-lobes of female florets 4, c. 0.4 mm long. *Achenes* moderately papillose hairy, not seen mature. *Pappus* 6–8 mm long. (Fig. 46)

Flowers spring.

Distribution and Habitat: Occurs in far south-western Western Australia in the Manjimup area and possibly further east at Ravensthorpe (Fig. 40f). Grows in lowlying areas in shrubland and forest.

Etymology: The epithet recognises a prominent early collector in Western Australia, Augustus Frederick Oldfield.

Notes: Although first collected in the mid-1800s, *S. oldfieldii* was not collected again until 1994. Similar to *S. longipilus* in having an indumentum of long, coarse hairs, but with narrower upper stem leaves, longer capitula, and the apex of phyllaries more reflexed. A specimen from near Ravensthorpe with developing capitula is tentatively identified as this species although the leaves are considerably larger than in the two other collections. Specimens from the proposed Perup Nature Reserve (*A.R. Annels 4931 & R.W. Hearn* PERTH) have some features of *S. oldfieldii* but are more likely to be hybrids between this species and *S. multicaulis*.

Selected specimens examined: **WESTERN AUSTRALIA**: West River Crossing, Old Ongerup Road, ca. 30 km WSW of Ravensthorpe, *K. Newbey 11258*, 8.x.1986 (PERTH); Low places, Blackwood River, *A.F. Oldfield* (MEL).

35. ***Senecio psilocarpus*** Belcher & Albr., *Muelleria* 8: 113 (1994)

Type: Victoria, SW edge of bushland reserve west of Mumbannar along Princes Highway, 37°54'12"S, 141°07'32"E, *D. Frood 1/92*, 13 Mar. 1992; holo: MEL.

Herbs to 0.8 m high. *Taproot* inconspicuous; secondary roots fleshy, c. 1 mm diam. *Stems* sprawling, glabrous or nearly so. *Leaves in middle third of stems* more or less evenly spaced and sized, narrow-oblanceolate, very narrow-elliptic, or linear, 7–10 cm long, l:w ratio c. 7–10, not dissected or lobate; segments 3 or 4 per side generally in middle third, spreading, triangular; base attenuate or auriculate, with auricles small; margin with scattered denticulations; upper surface ±glabrous or sparsely scabridulous; lower surface glabrous. *Uppermost leaves* narrow-linear (excluding auricles), l:w ratio c. 20–30; base auriculate, with auricles often bidentate, mildly amplexicaul; margin often appearing entire due to rolling. *Unit inflorescences* of several capitula; total number of capitula per stem often 8–30; overtopping absent or slight; mature lateral peduncles mostly 15–45 mm long. *Capitula*: calycular bracteoles 6–10, 2.0–4.0 mm long; peduncle and margin of bracteoles ±glabrous at anthesis; involucre 4.5–6.5(–7.5) mm long, 2.3–2.8 mm diam.; phyllaries predominantly 12–16, glabrous, with apex erect; stereomes (in dried specimens) slightly thickened, flat or gently convex, green or rarely tinged purple, commonly minutely black at tip, often purple in a zone c. 1 mm long below tip; post-

Figure 47. Distribution of a. *Senecio psilocarpus*; b. *S. squarrosus*; c. *S. macrocarpus*; d. *S. interpositus*; e. *S. georgianus*; f. *S. helichrysoides*.

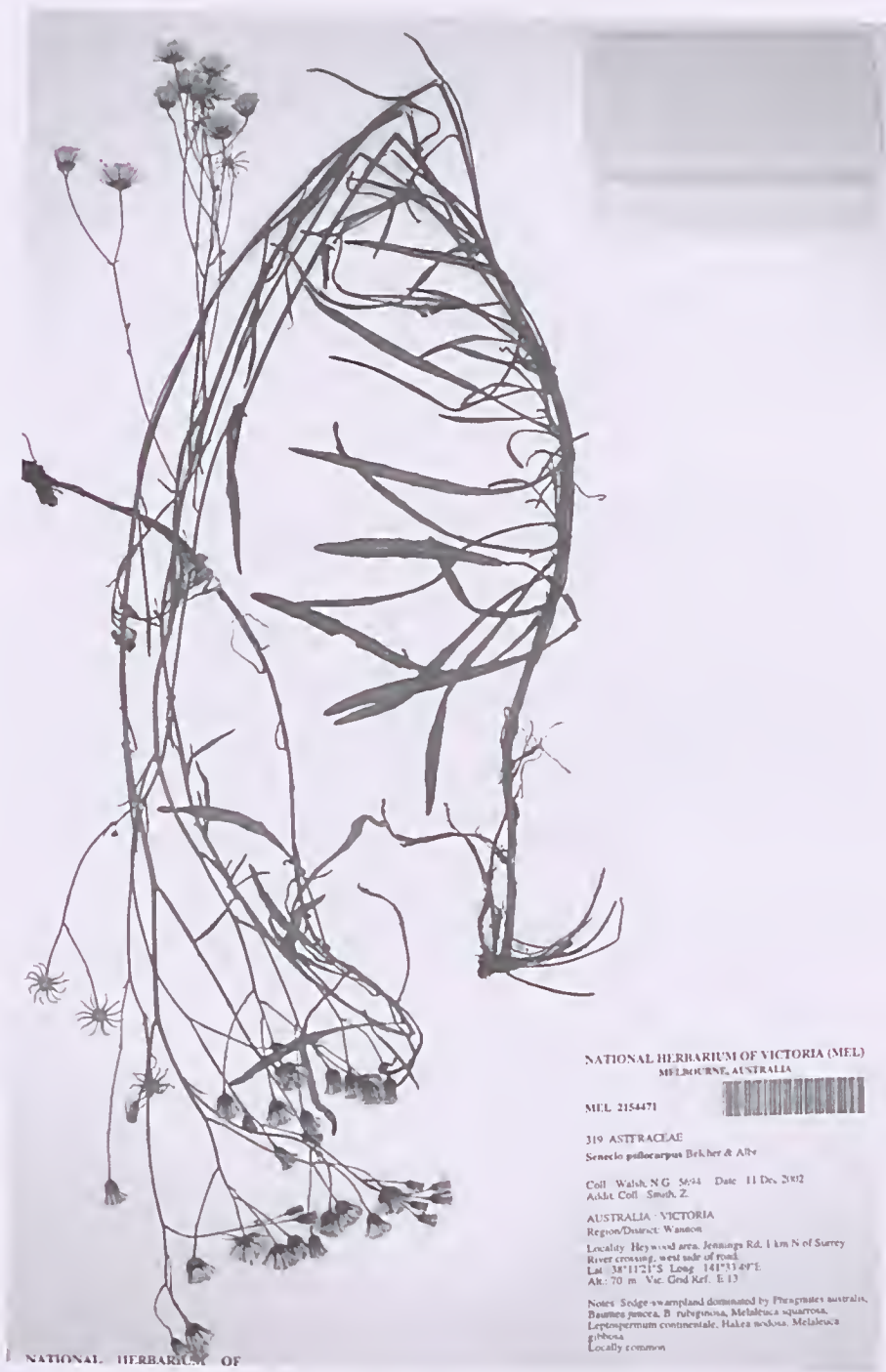
NATIONAL HERBARIUM OF VICTORIA (MEL)
MELBOURNE, AUSTRALIA
MEL 2154471
319 ASTERACEAE
Senecio psilocarpus Belcher & Albr
Coll Walsh, N.G. 5694 Date 11 Dec. 2002
Addit Coll Smith, Z.
AUSTRALIA : VICTORIA
Region/District Wannon
Locality Heywood area, Jennings Rd, 1 km N of Surrey River crossing, west side of road.
Lat. 38°11'21"S Long. 141°33'49"E
Alt.: 70 m Vic. Grid Ref. E 13
Notes Sedge-swampland dominated by Phragmites australis, Baumea juncea, B. rubiginosa, Melaleuca squarrosa, Leptospermum continentale, Hakea nodosa, Melaleuca gibbosa.
Locally common

Figure 48. *Senecio psilocarpus* (*N.G. Walsh 5694 & Z. Smith* MEL).

fructescence receptacle 4.5–6.5 mm diam., with phyllaries finally in various orientations. *Florets* 50–60, c. 80% female, corolla-lobes triangular, slightly thickened apically; corolla of bisexual florets 4.5–6.5 mm long, 4- or 5-lobed; corolla-lobes of female florets 4, c. 0.2 mm long. *Achenes* ±narrow-obloid, 1.8–2.5 mm long, usually orange to reddish-brown, glabrous, lustrous. *Pappus* 5–6 mm long. (Fig. 48)

Flowers summer–autumn.

Distribution and Habitat: Occurs in far south-eastern Australia; on the mainland from Honan's Scrub near Mt Gambier in South Australia east to Sale in south-eastern Victoria, and in north-eastern Tasmania from Flinders Island south-west to Cressy (Fig. 47a). Grows in swamps.

Notes: *Senecio psilocarpus* resembles *S. squarrosus* but has a sparser indumentum, shorter capitula, and glabrous achenes. The two species have a similar distribution, but the former has a stronger preference for aquatic habitats.

Selected specimens examined: **SOUTH AUSTRALIA:** Honans Scrub, Woods Forests, near Glencoe, *R.L. Taplin 670 & D.E. Murfet*, 9.iv.1994 (AD). **VICTORIA:** Connover Swamp (also known as Red Gum Swamp), SE of Drik Drik, *D.E. Albrecht 5157, I.C. Clarke & S.Day*, 3.xii.1992 (AD, CBG, MEL); Lysterfield Lake Park, *A.C. Beauglehole 71574*, 18.xi.1982 (MEL). **TASMANIA**: Cressy near Launceston, *J.H. Wilson*, Jan 1943 (HO).

36. *Senecio squarrosus* A.Rich., in J.S.C. Dumont d'Urville, *Voy. Astrolabe* 2: 107 (1834)

Erechtites richardiana DC., *Prodr.* 6: 297 (1838), *nom. illeg.*

Type: [New South Wales], 'Crescit in Novae-Hollandiae, loco vulgò Port Jackson [Sydney], *Gaudichaud 5*; holo: P.

[*Erechtites hispidula auct. non* (A.Rich.) DC.; G. Bentham, *Fl. Austral.* 3: 660 (1866), *p.p.*; J.M. Black, *Fl. S. Australia* 610 (1929); A. Ewart, *Fl. Victoria* 1179 (1931)]

Herbs to 0.8 m high. *Taproot* inconspicuous; secondary roots fleshy, 1–2 mm diam. *Stems* erect to sprawling, sometimes with scattered coarse hairs, with hairs commonly lost by anthesis, otherwise sparsely appressed-cottony particularly toward summit or glabrous. *Leaves in middle third of stems* sometimes becoming distinctly wider spaced and broader upwards, narrow-oblanceolate, very narrow-elliptic or linear, 7–13 cm long, l:w ratio c. 7–15, not dissected or coarse-dentate to lobate; segments 1–3 per side generally in middle third, antrorse, triangular or rarely roughly oblong; base attenuate; margin entire or with scattered denticulations or teeth; upper surface coarse-hairy; lower surface sometimes purple, coarse-hairy or glabrous except for midrib. *Uppermost leaves* mostly linear to narrow-linear, l:w ratio c. 10–30, sometimes lobate proximally; base auriculate, sometimes sagittately, with auricles often entire, sometimes bidentate, mildly amplexicaul; margin entire. *Unit inflorescences* of several to many capitula; total number of capitula per stem often 10–40; overtopping slight to moderate; mature lateral peduncles mostly 15–60 mm long. *Capitula*: calycular bracteoles 6–12, 2.0–4.0 mm long; peduncle and margin of bracteoles cobwebby at anthesis; involucre 6.0–11.0 mm long, 2.8–4.0 mm diam.; phyllaries (12–)16–25, glabrous, with apex sometimes recurved; stereomes (in dried specimens) gently to moderately convex, green or purple, minutely black at tip, commonly purple in a zone c. 1 mm long below tip; post-fructescence receptacle 4–6 mm diam., with phyllaries commonly finally ±erect. *Florets* 50–70, c. 80% female, corolla-lobes narrow-triangular, sometimes purple, moderately thickened apically; corolla of bisexual florets 6–10 mm long, 5-lobed; corolla-lobes of female florets 4 or 5, 0.3–0.4 mm long. *Achenes* narrow-obloid, 2.0–3.0 mm long, brown or blackish-brown, with papillose hairs in dense bands, l:w ratio of hairs 3–4. *Pappus* 6–8 mm long. (Figs 4, 49)

MEL 2023979
NATIONAL HERBARIUM OF VICTORIA (MEL)
MELBOURNE, AUSTRALIA
MEL 2023979
319 ASTERACEAE
Senecio squarrosus A.Rich.
Coll.: I.C. Clarke 2364 Date: 20 Oct 1993
AUSTRALIA VICTORIA
Locality: Lowan Mallee, Little Desert National Park, Western Block, on Border Track near junction of East-West Track + c. 200 m E of junction. (Locality is actually just W of Grid C37.)
Lat.: 36°36'S Long.: 140°58'E
Vic. Grid Ref.: C 37:
Notes: Growing in Eucalyptus leucoxylon open woodland with very open understorey of shrubs and herbs. Associated with Thomasia petalocalyx, Brachyloma daphnoides, Hydrocotyle laxiflora
NATIONAL HERBARIUM OF

Figure 49. *Senecio squarrosus* (*I.C. Clarke 2364* MEL).

Flowers mostly spring.

Distribution and Habitat: Occurs in southern Australia: from the Fleurieu Peninsula in south-eastern South Australia east-south-east to Bairnsdale in south-eastern Victoria, in north-eastern Tasmania at Launceston and in south-eastern Tasmania around Hobart. In Western Australia it occurs in the south-west in the Fitzgerald River and Bremer River areas east of Albany. The type specimen is from central-eastern New South Wales but there have been no collections from New South Wales since (Fig. 47b). Grows in sandy or clay soils commonly in lower lying areas in open forest and woodland.

Notes: The type specimen, collected in New South Wales, differs slightly from extant populations in South Australia, Victoria and Tasmania by having leaves more deeply dissected, lobation persisting in the bracts of the inflorescence, and coarse hairs more persistent on stems, but without more complete material, the type cannot with certainty be treated as taxonomically distinct. Leaves are sometimes glabrous on the lower surface and sometimes coarse-hairy. Purple corolla-lobes is an unusual feature recorded only in this species. Populations in far western Victoria and south-eastern South Australia have relatively large capitula and more densely coarse-hairy leaves than forms further east and in Tasmania.

Selected specimens examined: **WESTERN AUSTRALIA:** 11.2 km WSW of Annie Peak, Eyre Range (Fitzgerald River National Park), *K.R. Newbey 11349*, 1.xi.1986 (PERTH); Bremer R., ±10 miles [16 km] from mouth, *A.S. George 6990*, 29.x.1965 (PERTH). **SOUTH AUSTRALIA:** Kuitpo forest North-East, *A.G. Spooner 12444*, 18.xi.1990 (AD). **VICTORIA:** Westernport area. Bittern, 1.2 km SSE of Bittern PO, *R.J. Adair 2378*, 27.x.1990 (MEL); Little Desert National Park. Western Block, on Border Track near junction of East-West Track, *I.C. Clarke 2364*, 20.x.1993 (MEL). **TASMANIA:** Domain, Hobart, *W.M. Curtis*, 30.x.1958 (HO).

37. *Senecio macrocarpus* F.Muell. ex Belcher, *Muelleria* 5: 119 (1983)

Type: [Victoria], Wimmera district, Walmar station, *Dallachy 23*, 18 Sept. 1860; holo: MEL 22987.

[*Erechtites hispidula auct. non* (A.Rich) DC.: G. Bentham, *Fl. Austral.* 3: 660 (1866), *p.p. min.*; J.M. Black, *Fl. S. Australia* 610 (1929), *p.p.*]

Herbs to 0.6 m high. *Taproot* inconspicuous; secondary roots fleshy, c. 1–2 mm diam. *Stems* ±erect, sparsely to moderately densely appressed-cottony, becoming moderately branched from lower stem region. *Leaves in middle third of stems* more or less evenly spaced and sized, very narrow-elliptic, linear, or narrow-linear, 8–15 cm long, l:w ratio c. 8–20, not dissected or rarely lobate; segments 1–4 per side scattered along most of length including distal quarter, spreading, triangular–narrow-triangular; base attenuate; margin strongly revolute, entire or appearing so; upper surface coarse-hairy or glabrous, often transiently cobwebby; lower surface green, glabrous except for coarse-hairy midrib. *Uppermost leaves* narrow-linear, l:w ratio c. 20–50, not dissected or rarely with near-basal triangular lobes; base hardly auriculate; surfaces often cobwebby, with coarse hairs few or absent. *Unit inflorescences* of few to several capitula; total number of capitula per stem often 3–20; overtopping variable; mature lateral peduncles mostly 20–90 mm long. *Capitula*: calycular bracteoles 8–12, 3.0–6.0 mm long, often divergent; peduncle and margin of bracteoles sparsely cobwebby or glabrous at anthesis; involucre (7.0–)9.0–13.0 mm long, 3.0–5.0 mm diam.; phyllaries (13–)20–25, glabrous, with apex erect; stereomes (in dried specimens) gently convex, green or sometimes tinged purple, sometimes minutely black at tip, sometimes purple in a zone c. 1 mm long below tip; post-fructescence receptacle 5–7 mm diam., with phyllaries commonly finally erect. *Florets* c. 50–100, c. 80% female; corolla-lobes oblong-triangular, moderately thickened apically; corolla of bisexual florets 9–12 mm long, 5-lobed; corolla-lobes of female florets 4 or 5, 0.3–0.4 mm long. *Achenes*

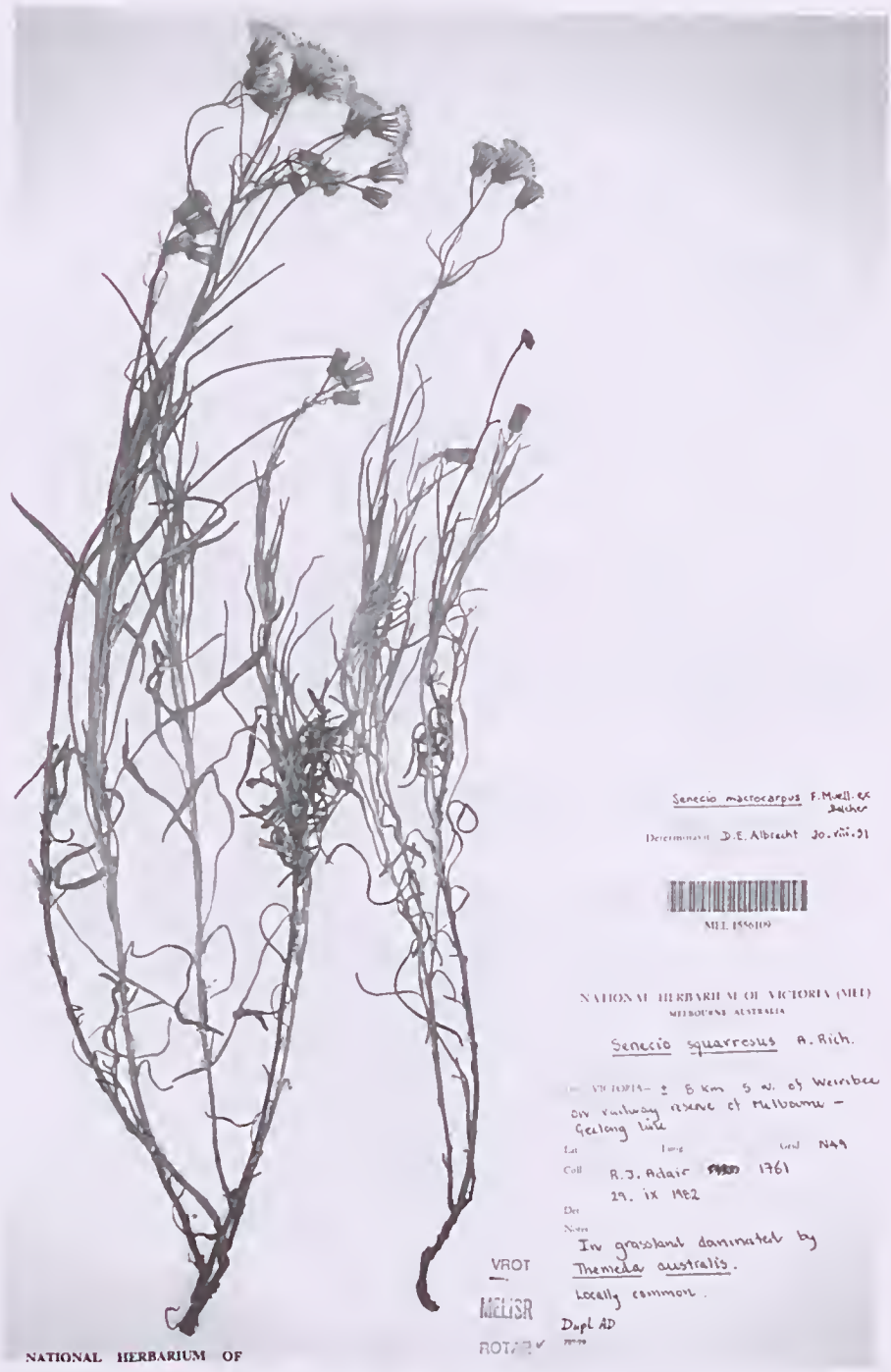

Figure 50. *Senecio macrocarpus* (*R.J. Adair 1761* MEL).

lageniform, 3.0–6.0 mm long, brown, papillose hairs in dense bands, l:w ratio of hairs c. 3–4. *Pappus* 7–10 mm long. (Figs 3e, 4i, 50)

Flowers mostly winter–spring.

Distribution and Habitat: Occurs in south-eastern Australia from Ardrossan in south-eastern South Australia south-east to Yan Yean in south-central Victoria, with an outlier recently recorded at Gundaroo in south-eastern New South Wales. There are only old records from northern Tasmania (Fig. 47c). Grows typically in low-lying areas, and recorded from basalt-derived clay or clay-loam soils, in grassland, sedgeland and woodland.

Notes: A species readily recognisable by its narrow-linear branch leaves, small number of very large capitula, and long, densely papillose-hairy, lageniform achenes. Lobed leaves usually only occur on primary stems. A collection from Yorke Peninsula in South Australia (*T. Smith 772*, AD) resembles *S. macrocarpus* but is atypical in having a coarse-hairy stem and leaves more densely coarse-hairy. It is possibly the result of hybridisation with *S. hispidissimus*.

An old collection from the Omeo plains of eastern Victoria (*Mueller* 1854, MEL) is similar to *S. macrocarpus* but capitula are smaller and phyllaries fewer. It also resembles both *S. nigrapicus* and *S. longipilus*. *Senecio nigrapicus* has been recorded from the Omeo area. This species has smaller and more numerous capitula than this specimen.

A specimen from Lake Hindmarsh (*D'Alton*, Oct. 1892, MEL) and to a lesser extent specimens from near Stawell (*Berwick s.n.*, 3 Sept. 1995, MEL) differ from typical *S. macrocarpus* in developing long basal or near-basal lobation on the uppermost leaves.

Senecio macrocarpus apparently hybridises with *S. squarrosus* in south-eastern South Australia.

Selected specimens examined: **SOUTH AUSTRALIA:** South-eastern. Messent Conservation Park, *R. Davies, P. Cooke & P. Green 62(1)e*, 17.ix.1986 (AD). **NEW SOUTH WALES:** Gundaroo, Lot 99 Dairy Creek Road. At junction of two gullies. NE section of lot, *D.A. Taylor 75*, Nov. 2001 (CANB, MELU). **VICTORIA:** ±8 km SW of Werribee, on railway reserve of Melbourne–Geelong line, *R.J. Adair 1761*, 29.ix.1982 (AD, MEL). **TASMANIA:** South Esk R., *coll. unknown* (MEL).

38. *Senecio interpositus* I.Thomps., *sp. nov.*

A *S. squarroso* A.Rich. foliis glabris, non aurieulatis, capitulis parvioribus, phyllariis paucioribus, floseulis hermaphroditis proportione pluribus differt.

Type: Australian Capital Territory, Namadgi National Park, Smokers Flat, *L.G. Adams & M. Gray 3976*, 13 Mar. 1986; holo: CANB; iso: MEL.

Herbs to 1.0 m high. *Taproot* inconspicuous (not well-known); secondary roots fleshy, 1–1.5 mm diam. *Stems* ascending to erect or erect, sparsely appressed-cottony or ±glabrous. *Leaves in middle third of stems* commonly becoming distinctly wider spaced and narrower upwards, very narrow-elliptic, 6–12 cm long, l:w ratio c. 6–10, not dissected or more often coarse-dentate to lobate; segments 4–8 per side in distal two-thirds, spreading to slightly antrorse, triangular; base attenuate; margin usually with scattered denticulations or teeth; upper surface ±glabrous or sparsely appressed-cottony; lower surface green, ±glabrous. *Uppermost leaves* very narrow-elliptic, or linear to narrow-linear, l:w ratio c. 8–20; base attenuate. *Unit inflorescences* of several to many capitula; total number of capitula per stem mostly 8–60; overtopping sometimes marked; mature lateral peduncles mostly 8–20 mm long. *Capitula*: calyeular braeteoles 6–8, 2.0–3.0 mm long; peduncle and margin of braeteoles sparsely to moderately cobwebby at anthesis; involuere cylindrical, 5.0–6.5 mm long, 2.0–2.5 mm diam.; phyllaries mostly 11–14, glabrous or sparsely cobwebby, with apex commonly strongly recurved;

HERBARIUM AUSTRALIENSE (CANB)
376794
ANHSIR
HOLOTYPE
FLORA OF AUSTRALIA PROJECT
Senecio interpositus I.Thomps.
Det
Date
AUSTRALIAN NATIONAL HERBARIUM (CANB)
Commonwealth Scientific & Industrial Research Organization Australia
ASTERACEAE
Senecio aff. dunedinensis
Det L.G.Adams, 1987
AUSTRALIA
Australian Capital Territory
Namadgi National Park Sonnara Flat
Altitude 1340 m
Grid ref. PA 730657
35° 32 S 148° 54 E
Open sub alpine heathy swamp amongst sparse black sally woodland; common on drier slopes. Erect perennial with dull green leaves, stems and capitula strongly tinged purple, florets dull yellow all B fid. floret sex ratio ca
L.G.Adams & M.Gray 3976
13 Mar 1986

Figure 51. *Senecio interpositus* (holotype: *L.G. Adams & M. Gray 3976* CANB).

stereomes (in dried specimens) thickened, flat, green or variably purple, minutely black at tip, sometimes purple in a zone 1–2 mm long below tip; post-fruteseenee reeeptaele 3–4 mm diam., with phyllaries usually finally erect. *Florets* 25–50, all bisexual or up to e. 50% female or at least with reduced corolla lobes, corolla-lobes triangular, not or slightly thickened apically; corolla of bisexual florets 5–7 mm long, 5-lobed; corolla-lobes of female florets 4 or 5, 0.4–0.8 mm long. *Achenes* ±narrowly obloid or oblong-ellipsoid, 2.5–3.0 mm long, tan or dark brown, glabrous or with papillose hairs seattered in lines, l:w ratio of hairs e. 2–3. *Pappus* 5–6 mm long. (Fig. 51)

Flowers summer–autumn.

Distribution and Habitat: Oeeurs in eastern Australia from Amiens in far south-eastern Queensland south to Bullock Creek east of Armidale in north-eastern New South Wales, and from the Brindabella Ranges in the Australian Capital Territory south-west to the McAlister River in eastern Vietoria (Fig. 47d). Grows in peaty clay soils in elevated or sub-alpine swampy flats or grassland and in woodland at altitudes over 900 m.

Etymology: The epithet alludes to the eomposition of the florets, with a higher proportion of bisexual florets than other diseiform speeies but often a lower proportion than diseoid speeies (L: *interpositus*, plaeed between)

Notes: Capitula of this species are usually diseiform with outer florets female or at least with only female struetures emergent from the corolla tube, and with distinetly smaller corollas. Although relatively reduced, the limbs and lobes of the eorollas of the female florets are generally larger than in other diseiform speeies. In the Northern Tablelands of New South Wales, however, a few speeimens have been eollected with diseoid eapitula. In all other respects these speeimens match the diseiform *S. interpositus*.

The obeonie eorolla-bases of this speeies are relatively large and elongate. The glabrous, lobed leaves and purple-pigmented, strongly reeurved phyllary apiees and basally-eobwebby eapitula also help to distinguish this species. In the New England area aehenes of some speeimens are dark brown and glabrous; aehenes with papillose hairs more or less restrieted to narrow grooves oeeur throughout the range of the speeies.

Selected speeimens examined: **QUEENSLAND:** Watson's Swamp, 6 km north of Amiens, *A.R. Bean 5850 & P.I. Forster* (BRI, NSW). **NEW SOUTH WALES:** New England, *C. Stuart* (MEL); Near Tuross Falls, 8 km ESE of Countegany, *L.G. Adams 3284*, 8.i.1974 (CANB); Tuross Falls Traek, Badja State Forest, *L.G. Adams & M.Gray 3925*, 2.i.1984 (CANB, MEL); Northern Tablelands, Bullock Creek, *D.L. Jones 5544 & C.H. Broers*, 7.xii.1989 (CBG); south end of Boonoo Boonoo National Park, 35 km NE of Tenterfield, *P.H.H. Cowper & G.J. White 38*, 8.ii.1994 (NE); Bullock Ck Swamp on Point Lookout Rd, *H.J. Wissmann*, 24.iii.1981 (MEL, NE). **AUSTRALIAN CAPITAL TERRITORY:** Kangaroo Creek, Corin Dam Road, *N.T. Burbidge 7549*, 19.i.1966 (BRI, CANB, MEL); Leura Gap, *J.H. Willis*, 13.i.1970 (MEL). **VICTORIA:** East Gippsland, Cowombat Plain, *A.C. Beauglehole 36555*, 26.i.1971& *E.W. Finck* (MEL); Bentley Plain, 2.8 km east of Mt Nugong, *N.G. Walsh 822*, 24.ii.1982 (MEL); Swamp margins of Pine Creek, between the Caledonia and McAlister Rivers, *N.H. Scarlett 84-12*, 8.i.1984 (AD); Mt Cobberas, *R.J. Bates 27243*, 7.i.1992 (AD).

39. *Senecio georgianus* DC., *Prodr.* 6: 371 (1838)

Type: [New South Wales] 'in Nova-Hollandia ad ripas laeus Georgii' [Lake George], *A. Cunningham*; holo: G (mierofiehe seen MEL); iso: K (photo seen CANB).

Erechtites caudicans Hook.f., *Hooker's London J. Bot.* 6: 122 (1847). Type: [Tasmania], Van Diemens Land, *R.C. Gunn*; holo: K. (photo seen CANB).

Herbs to 0.5 m high. *Roots* not seen. *Stems* erect, appressed-eobwebby. *Leaves in middle third of stems* more or less evenly spaced and sized, mostly narrow-oblaneeolate, very narrow-elliptic, or linear, 6–8 cm long, l:w ratio e. 8–12, not disseeted; base attenuate; margin revolute, appearing entire but actually minutely denticulate; upper

Figure 52. *Senecio georgianus* (*F. Mueller* MEL).

surface appressed-cottony, glabrescent; lower surface densely appressed-woolly. *Uppermost leaves* linear, l:w ratio c. 15–30; base attenuate. *Unit inflorescences* of several to many capitula; total number of capitula per stem often 10–40; overtopping moderate; mature lateral peduncles mostly 3–11(–20) mm long. *Capitula*: calycular bracteoles 6–10, 2.0–3.0 mm long; peduncle and margin of bracteoles glabrous or sparsely cobwebby at anthesis; involucre 5.0–7.0 mm long, 1.8–2.4 mm diam.; phyllaries 12–14, glabrous, with apex recurved; stereomes (in dried specimens) thickened, flat, green, minutely black at tip, sometimes purple in a zone c. 1 mm long below tip; post-fruticescence receptacle 3–4 mm diam., with phyllaries commonly finally erect. *Florets* 30–40, all bisexual, corolla-lobes triangular, thickened apically; corolla of central florets 5–6.5 mm long; corolla-lobes of outer florets 5, 0.5 mm long. *Achenes* ±narrow-obloid, 2.5–3.0 mm long, mostly very dark brown, sometimes olivaceous, papillose hairs in dense bands, l:w ratio of hairs c. 2–3. *Pappus* 5–6 mm long. (Fig. 52)

Flowers late summer–autumn.

Distribution and Habitat: Recorded from far south-eastern Australia but not recorded for over 140 years. Early records are from Lake George in south-eastern New South Wales, Omeo, and the McAllister River in Victoria, and from Tasmania where no locality given (Fig. 47e). Grows in woodlands, grasslands, herbfields or open shrublands in montane to subalpine areas.

Notes: The only specimen of this species collected from Tasmania is the type of *Erechtites caudicans*. Vegetative features are consistent in all collections; however, from the McAllister River area, collections are of inflorescences with marked differences in capitulum size.

Selected specimens examined: **VICTORIA:** Lake Omeo, *F. Mueller* (MEL).

40. *Senecio helichrysoides* F.Muell., *Trans. Proc. Victoria Inst. Adv. Sci.* 39 (1855)

Type: [South Australia], 'on low sandy loamy hills near the Wheal Barton mine' [near Truro], *F. Mueller*, Jan. 1847; holo: MEL.

Herbs to 0.5 m high. *Roots* not known. *Stems* erect, densely woolly. *Leaves in middle third of stems* more or less evenly spaced and sized, mostly narrow to very narrow-elliptic, 6–8 cm long, l:w ratio c. 4–7, not dissected or lobate; segments 3–6 per side, antrorse, triangular; base attenuate; margin entire; both surfaces densely woolly. *Uppermost leaves* linear, l:w ratio c. 10; base attenuate. *Unit inflorescences* of several capitula; total number of capitula per stem c. 20; overtopping not determined; mature lateral peduncles unknown. *Capitula*: calycular bracteoles 6–8, 4.0–5.0 mm long; peduncle and margin of bracteoles densely woolly; involucre c. 6 mm long, c. 3 mm diam.; phyllaries 12–14, woolly, with apex recurved; stereomes (in dried specimens) ±flat; post-fruticescence receptacle unknown. *Florets* c. 40, all bisexual, corolla-lobes triangular, hardly thickened apically; corolla of central florets 5–6 mm long, corolla-lobes c. 0.5 mm long. *Achenes* glabrous (according to protologue; not seen). *Pappus* c. 6 mm long. (Fig. 53)

Flowers summer.

Distribution and Habitat: Recorded from south-eastern South Australia and north-western Victoria (Fig. 47f). Grows in sandy areas on low hills or flats.

Notes: A distinctive species but only three collections have been made and none since the mid-1800s. Allied to *S. georgianus* and *S. interpositus* and placed by Bentham under the former, but differing by its extreme woolliness on all parts and its long calycular bracteoles. A few specimens collected from northern Victoria and housed at K appear to match the holotype of *S. helichrysoides* although the leaves are coarsely dentate. A

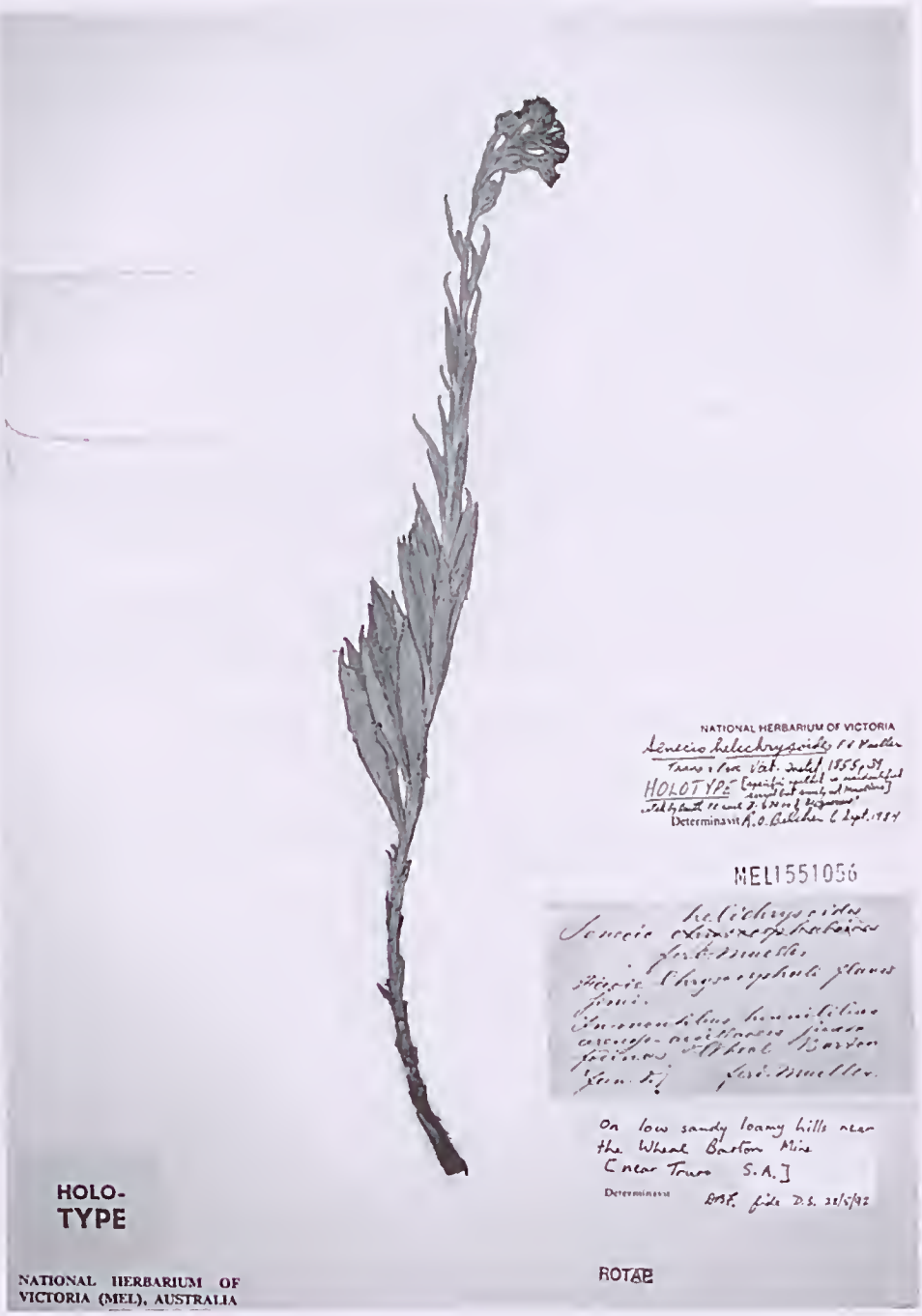

Figure 53. *Senecio helichrysoides* (*F. Mueller* MEL).

specimen from Lake Hindmarsh is sterile and is labelled by Mueller as *S. odoratus* var. *spodochrous*, and another, *Robertson 321*, is a flowering specimen.

Selected specimens examined: **VICTORIA:** Lake Hindmarsh, *coll. unknown* (MEL).

Doubtful or excluded names

Senecio laticostatus Belcher, *Ann. Missouri Bot. Gard.* 43: 64 (1956); *Erechtites arguta* var. *microcephala* Benth., *Fl. Austral.* 3: 659 (1867).

Type: Flats beyond the Brodribb River, *F. Mueller*, Jan. 1855; holo: MEL.

The specimen on which these names are based appears to be an aberrant specimen with several features discordant with *Senecio* morphology and with apparently non-viable achenes.

Senecio apargiaefolius Walp., *Linnaea* 14: 309 (1840), as *apargiaefolius*; *Erechtites apargiifolia* (Walp.) Sond., *Linnaea* 25: 524 (1853), as *apargiaefolia*.

Type: [New South Wales], 'Nova Hollandia' [Maneroo region according to G. Bentham], *Lhotsky*; holo: ?K!EL, according to Belcher (1956).

The identity of the type specimen remains unclear. Walpers described it as a species with homogamous capitula and glabrous achenes, and it differs in several other ways from the specimen cited by Sonder as an example of *E. apargiifolia*, which is in fact a specimen of *S. phelleus*.

Erechtites muelleri Lange, *Ind. Sem. Hort. Acad. Haunensi* 28 (1862), as *Mulleri*

Type: Australia, 'Hab. Nova Hollandia'.

Belcher (1956) discusses this species under his *S. hispidulus* x *S. quadridentatus*. Although he did not see the type, apparently at Copenhagen, specimens from Vienna determined as *E. muelleri* and said to have been raised from seed from Copenhagen, were examined by him. From his description these specimens are likely to be *S. tenuiflorus*, but while there is doubt about the nature of the type specimen, it is best to exclude this name.

Acknowledgements

I am grateful for the assistance given by the School of Botany, University of Melbourne and by the Royal Botanic Gardens, Melbourne for the use of their facilities, Neville Walsh for his assistance with field work and many other aspects of my research, Dr Niels Klazenga and Dr Teresa Lebel for their assistance with mapping and imaging, the technical staff at MEL for their assistance with loans, and the reviewers of this paper for their helpful remarks. I would also like to thank the directors of AD, BRI, CANB, DNA, HO, NE and NSW for the loan of specimens. This study was funded by a three year ABRS grant (Grant no: 2000/3192).

References

Belcher, R.O. (1956). A revision of the genus *Erechtites* (Compositae) with inquiries into *Senecio* and *Arrhenechthites*. *Annals of the Missouri Botanical Garden* **43**, 1–85.

Belcher, R.O. (1983). New Australian species of erechthitoid *Senecio* (Asteraceae). *Muelleria* **5**, 119–122.

Belcher, R.O. & Albrecht, D.E. (1994). *Senecio psilocarpus* (Asteraceae), a new species of erechthitoid *Senecio* from western Victoria and south-eastern South Australia. *Muelleria* **8**, 113–117.

Bentham, G. (1867). *Erechtites*. *Flora Australiensis* **3**, 657–661.

Candolle, A.P. de (1838) *Erechtites*. *Prodromus* **6**, 295–297.

Drury, D.G. (1974). Illustrated and annotated key to the erechtitoid Senecios in New Zealand (Senecioneae – Compositae) with a description of *Senecio diaschides*. *New Zealand Journal of Botany* **12**, 513–540.

Harden, G.J. (1992). *Senecio*. *Flora of New South Wales* **3**, 299–312.

Lawrence, M.E. (1980). *Senecio* L. (Asteraceae) in Australia: Chromosome numbers and the occurrence of polyploidy. *Australian Journal of Botany* **28**, 151–165.

Lawrence, M.E. (1985a). Studies in *Senecio* (Compositae). *Journal of the Adelaide Botanic Gardens* **7(3)**, 289–293.

Lawrence, M.E. (1985b). *Senecio* L. (Asteraceae) in Australia: Reproductive biology of a genus found primarily in unstable environments. *Australian Journal of Botany* **33**, 151–165.

Richard, A. (1834). 'Corymbiferae. *Senecio*' in J.C.S. Dumont d'Urville (ed.), *Voyage de découvertes L'Astrolabe, Botanique (Sertum Astrolabianum)*, 92–133. Tastu: Paris.

Thompson, I.R. (2004). Taxonomic studies of Australian *Senecio* (Asteraceae): 2. The shrubby, discoid species and the allied radiate species *Senecio linearifolius*. *Muelleria* **20**: (in press)

Walsh, N.G. (1999). *Senecio*. *Flora of Victoria* **4**, 941–965.

Webb, C.J. (1988). *Senecio*. *Flora of New Zealand* **4**, 265–287.

Index of Scientific Names

Epithets of accepted names are in roman (with **bold** type for new names) and synonyms are in *italics*. Chromosome numbers of Lawrence (1980) are indicated under current names and the names used by Lawrence. The numbers refer to the number of the accepted species or subspecies as given in the taxonomy section. Excl. refers to names listed under Excluded Names. Square brackets indicates a misapplication of the name.

Name	No.	Page no.
Erechtites		
apargiifolia (Walp.) Sond.	excl.	211
arguta (A.Rich.) DC.	12	145
arguta var. *asper* Hook.f.	10	138
arguta var. *bathurstiana* (DC.) Domin.	8	134
arguta var. *dissecta* Benth.	8, [12a]	134
arguta var. *glomerata* (DC.) Domin	12a	145
arguta var. *microcephala* Benth.	[12b], excl.	211
arguta var. *obovata* Hook.f.	12a	145
atkinsoniae F.Muell.	5	127
bathurstiana DC.	8	134
caudicans Hook.f.	39	207
erecta F.Muell. ex Lange	20	164
glabrescens DC.	19	162
glandulosus DC.	18	158
glomerata DC.	12a	145
glomerata DC. var. *subincisa* DC.	12a	145
glomerata DC. var. *polycephala* DC.	12a	145
gunnii Hook.f.	27	181
hispidula (A.Rich.) DC.	9, [36], [37]	136
incana Turcz.	20	164
labillardierei Hieron.	1	118
lacerata F.Muell.	14	152
minima (Poir.) DC.	1	118
mixta (A.Rich.) DC.	[15]	154
picridioides Turcz.	4	125
picridioides Sond.	15	154
prenanthoides DC.	1	118
prenanthoides var. *picridioides* (Turcz.) Benth.	4	125
pumila DC.	1	118
quadridentata (Labill.) DC.	20	164
quadridentata var. *glabrescens* (DC.) Benth.	19	162
quadridentata var. *glandulosa* (DC.) Domin	18	158
quadridentata var. *gunnii* (Hook.f.) Benth.	27	181
richardiana DC.	36	201
sonchoides DC.	3	123
tenuiflora DC.	26	177
Senecio		
apargiifolius Walp.	excl.	211
argutus A.Rich.	12a	145
atkinsoniae F.Muell.	5	127
bathurstianus (DC.) Seh.Bip. [n = 30]	8	134
bipinnatisectus Belcher [2n = 60]	5	127
biserratus Belcher [n = 50]	3	123
brevitubulus I.Thomps.	7	131
calulii Belcher	2	121
diaschides D.G.Drury [n = 30]	2	121

distalilobatus I.Thomps. [n = 50]	6	129
dolichocephalus I.Thomps.	21	167
extensus I.Thomps.	13	150
*flaccidus*A.Rich.	3	123
georgianus DC.	39	207
glabrescens (DC.) Sch.Bip.	19	162
glandulosus (DC.) Sch.Bip.	18	158
glomeratus Desf. ex Poir	12	143
glomeratus subsp. glomeratus [n = 30]	12a	145
glomeratus subsp. **longifructus** I.Thomps.	12b	148
gunnii (Hook.f.) Belcher [n = 20]	27	181
helichrysoides F.Muell.	40	209
heterophyllus Colenso	1	118
hispidissimus I.Thomps. [n = 30]	10	138
hispidulus A.Rich. [n = 30]	9	136
hispidulus var. *dissectus* (Benth.) Belcher [n = 30]	8	134
interpositus I.Thomps.	38	205
laceratus (F.Muell.) Belcher	14	152
lageniformis I.Thomps.	31	189
laticostatus Belcher	excl.	211
lessonianus Sch.Bip.	12	145
longicollaris I.Thomps.	16	156
longipilus I.Thomps.	33	193
macrocarpus Belcher	37	203
microbasis I.Thomps.	24	175
minimus Poir. [n = 30]	1	118
minimus var. *picridioides* (Turcz.) Belcher	4	125
muelleri Regel	1	118
multicaulis A.Rich.	11	140
multicaulis subsp. multicaulis	11a	141
multicaulis subsp. **stirlingensis** I.Thomps.	11b	143
nigrapicus I.Thomps.	32	191
niveoplanus I.Thomps.	28	183
oldfieldii I.Thomps.	34	195
phelleus I.Thomps.	23	171
picridioides (Turcz.) M.E.Lawr. [n = 30]	4	125
prenanthoides A.Rich. [n = 20]	29	185
psilocarpus Albr. and Belcher	35	198
psilophyllus I.Thomps.	30	189
pusillus A.Rich.	11a	141
quadridentatus Labill. [n = 20]	20	164
queenslandicus I.Thomps.	22	169
runcinifolius Willis	15	154
scabrellus I.Thomps.	25	177
sp. 1 sensu N.G. Walsh	13	150
sp. 2 sensu N.G. Walsh	31	189
sp. aff. tenuiflorus sensu J.H. Ross	29	185
sp. B sensu M.E. Lawrence (1980) [n = 30]	2	121
sp. C, forms 1 & 2 sensu M.E. Lawrence (1980) [n = 20]	29	185
sp. C, forms 3 & 4 sensu M.E. Lawrence (1980) [n = 30]	10	138
sp. E sensu G.J. Harden (1992), *p.p.*	29	185
sp. *N sensu* G.J. Harden (1992), *p.p.*	31, 33	189, 193
squarrosus A.Rich.	36	201
tasmanicus I.Thomps.	17	158
tenuiflorus (DC.) Sch.Bip	26	177

CONTENTS

Volume 19 2004

Contributed Papers	Page
Two new wattles endemic to Victoria – Neville G. Walsh	3
Morphometric Study of a Hybrid Population of *Acacia verniciflua* and *A. aspera* (*Acacia* subgenus *Phyllodineae*) – Robert C. Piccinin, Daniel J. Murphy and Pauline Y. Ladiges	9
A revision of the *Thelymitra pauciflora* R.Br. (Orchidaceae) complex in Australia – Jeffrey A. Jeanes	19
A revision of *Bedfordia* DC. (Asteraceae) – A.E. (Tony) Orchard	81
Olearia brevipedunculata (Asteraceae): a new species from alpine areas of mainland Australia. – Neville G. Walsh	95
Taxonomic studies of Australian *Senecio* (Asteraceae): 1. The disciform species – Ian R. Thompson	101